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MOTOR AGE

Volume XXXVII
Number 21

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CHICAGO, MAY 20, 1920

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Three Dollars a Year

This Is the Secret of Essex Sales Success

*Its Motor is Patented and Three Times More
Powerful Than Standard Motors Its Size*

We now reveal the reason Essex has swept all official records for cars of its motor size, from 1 to 50 hours.

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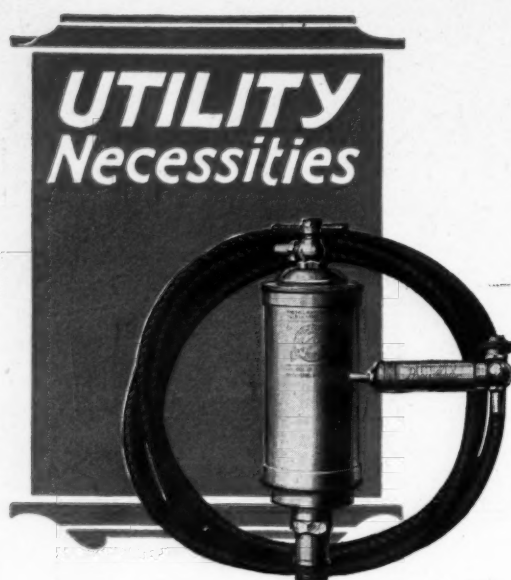
Isn't the time now at hand when the market for "just any car to get delivery" is about to disappear?

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(E-10)



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1323 S. Michigan Avenue, Chicago

MOTOR AGE

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CONTENTS

Copyright 1920, The Class Journal Co.

Shall We Divorce the Shop.....	7
A Talk on Accessibility.....	9
Mechanics of Tomorrow.....	10
A Courtesy Engineer Meets You at the Door.....	12
A Simple Record of Each Car.....	15
Adjusting the Carbureter—Article III.....	17
Designing a Custom Body.....	19
Eagle Process of Repairing Scored Cylinders.....	33

NEWS SECTION

Fuel Shortage Latest Motor Problem.....	21
Oregon Without Gasoline as Result of Gravity Law.....	22
Spokane Motor Car Association Reorganizes Program.....	22
Seattle Dealers Start Car Owner Educational Plan.....	23
Weather Bulletins Aid Massachusetts Truck Men.....	23
South Forms Border to Gulf Highway Body.....	24
C. H. Gurnett, Class Journal Man, Dies.....	24
Macon Dealers' Late Spring Show Big Success.....	25
Big Interest Shown in 500-Mile Race This Year.....	26
Dallas Plans Big Motor Racing Carnival.....	26
Louisiana Plans \$35,000,000 Good Roads Request.....	27
Texas "Ship-By-Truck" Impresses Farmers.....	27
Take Up Freight Car Shortage Problem.....	28
Denies Federal Reserve Will Issue Secret Order.....	28
Chicago Opens Boulevard Link Bridge.....	29
Brooklyn Service Men Increase Membership.....	30
Big Garage Being Built for Dallas.....	30
Denver Adds to Trade Association Roll.....	31
Columbus, O., Selected for Only Tractor Show.....	31

DEPARTMENTS

Standard Mechanical Tractor Operations.....	34
Servicing the Overland Four.....	36
Garage Planning.....	38
The Readers' Clearing House.....	40
The Accessory Corner.....	46
Service Equipment.....	47
Law in Your Business.....	48
Weekly Wiring Chart.....	49
The Automotive Repair Shop.....	50
Where to Obtain Parts for Orphan Passenger Cars and Trucks.....	51
Electrical Equipment Tables.....	52
From the Four Winds.....	56

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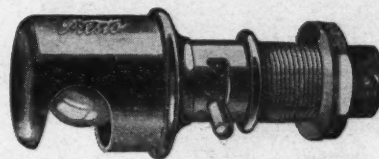
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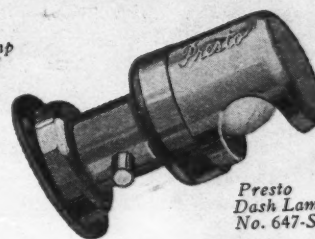
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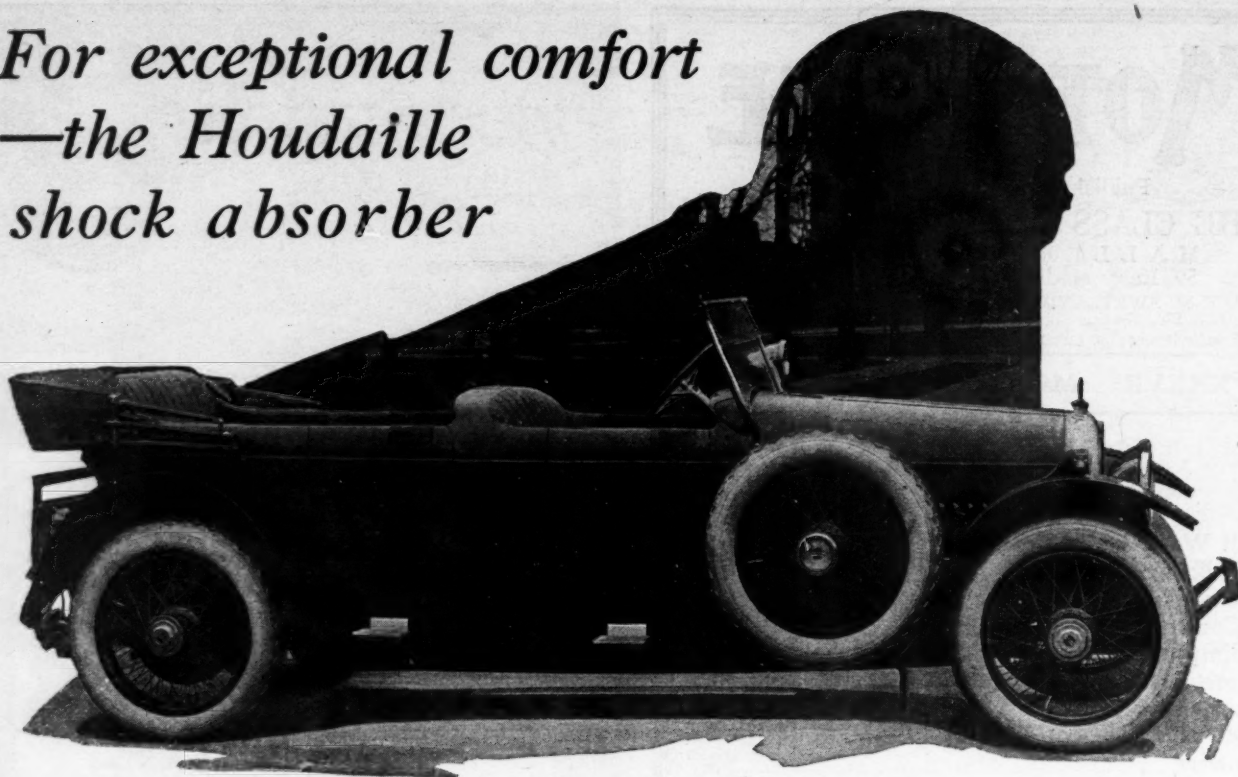
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cars are:**

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The Publisher's Service Station

Rendering Service to Help You Render Service



ATTENTION PLEASE!

On numerous occasions we've overheard dealers discussing divorce, not the kind that keeps our courts busy, but rather a department of their business—their shops. Some claim it is better to merely sell cars and leave the job of keeping them in repair to some other institution, perhaps a shop that specializes in repair and service work on all cars.

Other dealers take an opposite viewpoint and believe that the shop must be retained as a necessary part of rendering service. Here's their point of view:

Every dealer who sells cars is anxious to have those cars make good, and if he trusts to someone else to keep them running, he takes a chance. This brings up the question of whether or not he can provide more satisfactory service himself—and also involves installing a shop.

This interesting subject is discussed in this issue—see the lead article.

My Kingdom for a Mechanic!

Where are the mechanics of tomorrow coming from? The mechanic situation is bad enough now, as every dealer will tell you, but it might be worse as time goes on unless something is done to increase the supply of skilled men. The public schools of this country are beginning to add to their curriculum short courses in automotive mechanics and in this week's issue we are telling our readers about the method used by one school in training boys to become skilled in the arts and sciences of motor car repairing.

Meet the Courtesy Engineer

Courtesy, like building a bridge, has to be engineered. It is a deplorable fact that in many of our modern service stations courtesy is lacking. What availeth it if we have the finest service station in our town, the most

up-to-date equipment, the largest shop, etc., if customers hate to come to our place because they are not met and treated in a courteous manner? There are many dealers who are building up an enviable business because of their courteous treatment of customers. **MOTOR AGE** tells you in this number how the Auto-Electric Service Station of Detroit is reaping a harvest in this manner.

Next Week

In next week's issue of **MOTOR AGE**, we are going to give our readers their fill on Indianapolis race matters. There are going to be articles on the previous races, statistical evidence of what has been done from 1911 up to the present time. There will be descriptions and specifications of the race cars entered this year.

This year's race is for cars of 183 cubic inches piston displacement and promises to be the greatest event Indianapolis speedway ever held. **MOTOR AGE** will be there with a staff of experts and get for its readers not only the story of the race, but a story from the pits, giving some inside information on why cars withstood the terrific grind or why they fell by the wayside.

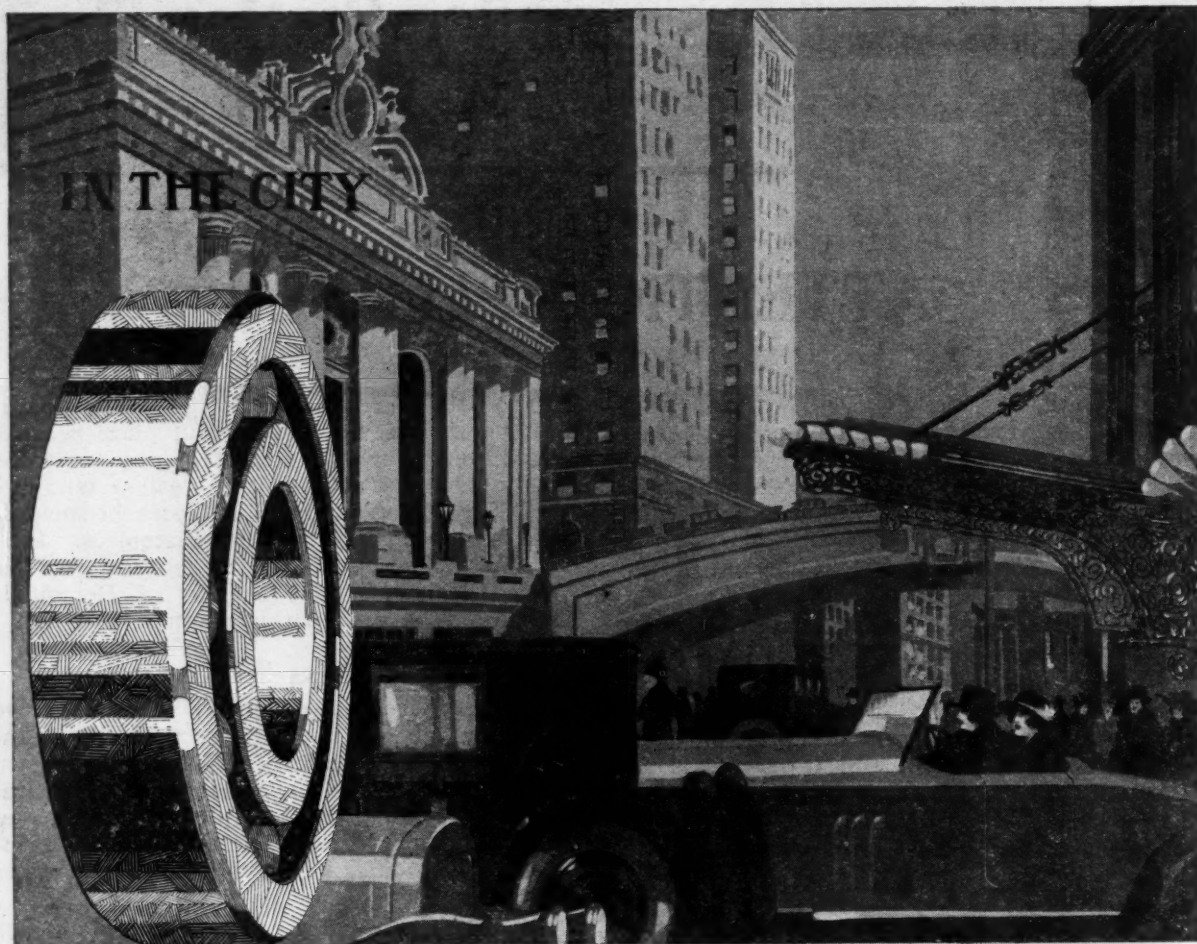
The June 3 issue which goes to press Monday, May 31—the day of the race—will contain pictures of the winner and telegraphed story of the race.

Coming

When passenger cars are hard to get it is time for the dealer to think of the truck business. But the dealer who takes on a truck has something to learn about the proper servicing of such a vehicle. **MOTOR AGE** will, in the near future launch a series of articles dealing with the various phases of the truck business as regards the maintenance of them.

NOTICE!

Effective June 1, 1920, the Annual Domestic Subscription Rate of **MOTOR AGE** will be \$5.00.



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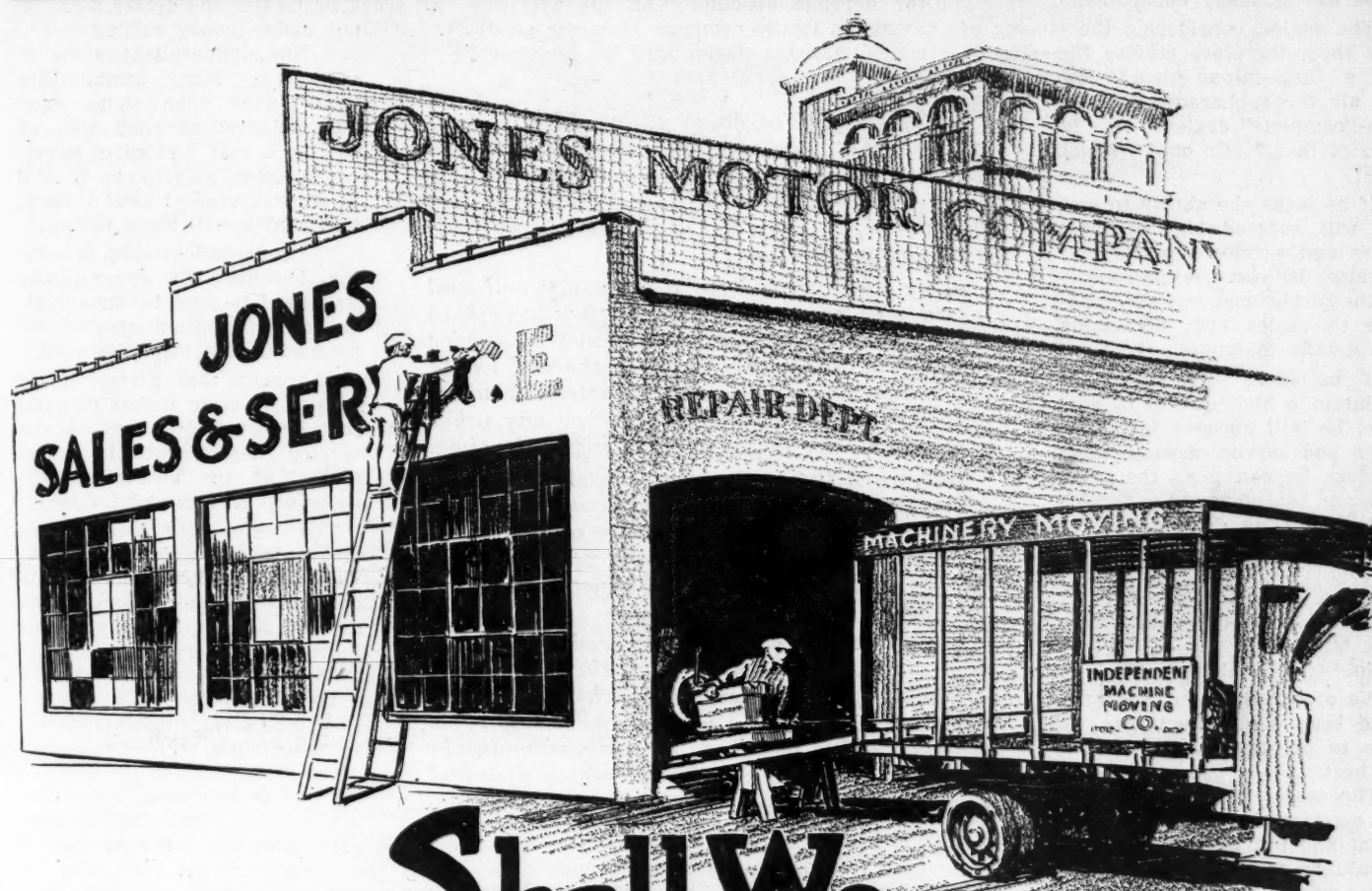
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MOTOR AGE



Shall We Divorce the Shop?

THE starting of a car, truck or tractor business without a shop is a personal matter for the dealer to decide, considering many things. It is the same with a dealer who may have the notion of closing his shop.

The biggest reasons for continuing or closing the shop, lie within the dealer himself. Here are three such considerations:

- First—Does he want to run a shop?
- Second—Can he run a shop? and
- Third—Is he running the shop efficiently?

Let's put these questions in a different form—and thus save a whole lot of explanation, and reading:

- First—Is the dealer a salesman?
- Second—Is he a service man? and
- Third—Is he a manager?

Some dealers combine the qualities of salesman, service man and manager; many do not.

It has been said that most wholesale salesmen fail when they get too ambitious, and establish retail businesses for themselves. They fail because they can think only selling; and cannot, or do not, put their minds to the study of managing the various details of their business. They may fall down hardest in financing, or in credits, or in accounting—they are weak in some vital particular, which weakness more than overcomes their fine selling ability.

The dealer who is a real salesman, who thinks selling, dreams selling;

who cannot get his mind on any other phase of the business—this is the dealer who, in many cases, should divorce his shop. He can make more money by confining his efforts to selling.

But many a salesman is a service man, too. We find such combinations more often in the automotive industry than in any other industry, except possibly the electrical. Being built on service, the automotive industry requires of its agents, conscientious attention to service subjects. The dealer who has the instinct of service, who pictures the car he handles in use by owners, kept in use by his help, such a dealer—usually—should retain his service department.

Then there are service men who are not salesmen—they themselves can't sell, nor can they inspire employees to sell. They should—usually—divorce

the sales department from their business. They should confine their efforts to service.

The managers! They're the dealers who make the big money. Take a salesman who can lead other salesmen; add the qualities of the service man who knows what service should be given and how to give it. Add now the ability to manage a business—and you have the dealer who will succeed big with a business having many departments.

The dealer, considering the closing of his shop, therefore studies himself. Is he a three-in-one man? Has he all three characteristics of the "complete" dealer? Has he two of them? Or one? Which one?

If he lacks the ability to sell, he will succeed big, with his sales and service departments; because he can see personally to the service end, and can manage the sales end, delegating the details to others.

If he lacks the ability to maintain a high quality of service, he will succeed big, with sales and service departments; because he can push the sales end, and can manage the service end, delegating details to competent department heads.

If he lacks managerial ability, he may succeed big—with a sales business—or—with a service business.

Not with both!

We are all happier, and succeed best, doing the things we like to do, the things we can do best.

The dealer who realizes that he can't run a service department and put his heart into it, would be far happier, and would make more money, by helping some garageman establish competent service on the car, truck or tractor he sells. And the service man who doesn't eagerly study selling, would be happier and richer, by concentrating on service. The dealer who knows he's a manager, can be happiest and most prosperous with the two departments.

The time is coming when a dealer can establish and build a sales business without a shop.

The time will come when every community will have its efficient, dependable service stations, recommended to owners by dealers. These will be stations designated for service on the cars, trucks or tractors sold by the dealers.

There are some communities that have such service stations now. In such communities, the dealer may safely eliminate his shop if he wants to. In such communities, a dealer may establish a car, truck or tractor business, confident that his owners will get service.

The dealer cannot answer the question, "Shall I divorce the shop?" according to his own desires.

He must consider the interest of the community.

The community must be served. The people who own the cars, trucks or tractors sold by the dealer, must have repairs made when needed, in a shop where service can be given well, on the car, truck or tractor that the dealer sells.

Continuous selling, the building of a big business in any car, truck or tractor depends absolutely on the service available to the owners. However good a salesman the dealer may be, however

THE question of doing away with a shop is one that probably has confronted every dealer at some time or other. Especially is it given serious thought by those dealers who hold that the repair shop end of their business is not a paying proposition.

They look upon it as a necessary evil and would be glad to give it up if they were sure their customers would get the sort of service from some other source that in the end would make them repeat customers, or potential buyers of a new car of the same make or any other make the dealer might be handling at the time.

But, when their service is farmed out dealers are not sure of holding their customers and consequently hang on to the service or repair department. And it is easy to see why this must be the case, speaking of the dealers in the smaller towns.

When you buy a typewriter, sewing machine, or a piano, you naturally seek the party from whom the purchase was made when repairs or advice is necessary. The concerns selling typewriters, talking machines, or cameras, maintain expensive service departments because they feel they are better qualified to give service.

good a sales manager, he cannot keep on selling unless the buyers get good use out of the equipment they buy.

It doesn't make so much difference (to the public) who gives service—whether the dealer himself, or an independent service expert. It doesn't make a great deal of difference in the volume of sales of the dealer, whether he provides the service himself, or sees his owners getting satisfactory service at an independent shop.

The vital consideration is that the owners get good service, somewhere, conveniently, on the car, truck or tractor the dealer sells.

The theoretically ideal automotive business—from the dealer's standpoint, as well as from the standpoint of the public—has sales, service and accessories under one ownership. Then the dealer knows that his owners are getting the right kind of service. And the dealer knows he is getting all possible profits from all money spent in the community chargeable to ownership of the car, truck or tractor he sells.

A thousand good reasons exist, any one of which might restrain a dealer from maintaining a service station, or

selling accessories. Not one of these good reasons is valid, however, if the dealer's community is not getting service, or is not getting accessories.

The owners can get along without accessories; it is merely a matter of whether the dealer wants to make more money or not, as to his putting in an accessory department.

The public can't get along without service. There must be service on the car, truck or tractor the dealer sells, or he will not make money selling.

We know the independent shop is coming. Many communities sorely need such shops now. The independent shop will be run by a real service manager, on business principles; it will be a much-praised local institution, and it will make money.

The independent shop is coming because the communities will need it—and because dealers don't maintain service departments that meet the need.

The shop that gives service on two or more makes of cars, trucks or tractors, may be the service department, in some towns, of the dealer in one make of car, truck or tractor.

The dealer may develop service on many makes—and provide the repair facilities his community requires—quite as easily and as profitably as an independent service station owner.

There may be many reasons to withhold the dealer from developing such service on other makes than the one he sells.

There is one dominating reason for his continuing to give service on the make he sells—

"Will the community get service if he doesn't give it?"

If the community will get service, then he can safely consider various reasons for doing away with his shop.

"My ideas on this subject are this: The dealer in a large city who can sell enough cars, or trucks so that he can devote all his time to the selling end and not be bothered with the shop end, will in my opinion be ahead in money and avoid a lot of trouble arising from some people always wanting to see what makes the wheels go around, and always wanting more service than was ever intended. This holds good only in large cities, as the small towns up to 65,000 or 75,000 people do not sell enough to hold up the overhead and it is necessary to have some other source of revenue. At the most it takes a lot of close figuring to make a shop pay, unless it is operating to full capacity at all times, and having a good man to see that there are no leaks, such as rob most of the shops of their profits. The best an exclusive dealer could do to get along without a shop would be to have nothing but a few service men to take care of all small adjustments, and see that the cars go out in perfect shape to the user."



Exaggerated? Of course! But there are some designs on the market where it is literally necessary to tear down the whole car to make minor repairs

A TALK ON ACCESSIBILITY

Manufacturer Real Cause of Service Man's Dissatisfied Customers

BY ROY E. BERG

HELD up in the light of satisfaction, the automotive service business in this country is not even in the twilight; in fact, if we are to carry the simile further, we can truthfully use the term complete darkness and come closer to the real situation. If we were to choose any other business and examine into it, we would find that there is at least some sense of satisfaction between the server and the served; the business and its customers, in other words.

One can hardly enter any service station without failing to note the general dissatisfaction that pervades at the time the car owner pays his bill. And the most natural assumption for the car owner to make is that the service man is to blame. "One of the worst profiteers I know of," is his comment after the bill is paid.

Service Man Hindered

It is extremely difficult for the car owner to appreciate that the service man has a limitation placed upon him before he commences actual work on the car. That limitation is the make-up of the car. The make-up on some cars is better than others. Some machines are so made up that they were never intended to be taken apart, in this world, unless with the aid of a keg of gunpowder, and then the car would be in the next world. Let us take the H—— car. If a leak were to be repaired in the radiator of this car, the actual charge for the work of soldering would probably be less than one dollar, plus a labor charge of at least seven dollars, necessitated by the manner in which the radiator is secured to the frame.

Take the O—— car as another example. The third brush on the generator of this machine is in the most out-of-the-way place imaginable. Mind, that

this is only an adjustment. Still, to perform this adjustment the labor charge at \$1.25 per hour would be five dollars. Another example is the C—— car. To remove the generator on this car the radiator must be removed first. Here we have another unnecessary labor charge of over five dollars.

The service man is surely entitled to charge for his time. Yet the very fact that he does so creates a howl by the car owner.

If the car manufacturers conducted all the service business in the country, we would have wonderfully accessible machines. Faulty design would not be allowed to exist.

Here the manufacturer might feel that he has been unduly criticised. He might arise to the point in issue and state that accessibility as provided beyond the state of a well worked out production design is not defensible.

We are willing to grant that a design worked out for production goes hand in hand with the idea of accessibility. But if the design were reconsidered from the standpoint of accessibility and servicing a complete change could be effected, still retaining all the advantages of a production job.

MOTOR AGE contends that accessibility is just as important a factor of design as any other consideration.

The whole automotive industry will be affected detrimentally unless this subject of accessibility is given more consideration.

The old axiom, "It isn't the original cost; it's the upkeep," adequately expresses the sentiment. When the car owners become dissatisfied and the service men are affected to the extent where the joy of business is removed, we will

have reached the point where the service business starts on a toboggan slide of degeneration. The dealer is the next one reached in the chain, and car sales with him will experience a new line of resistance, viz., overcoming the service obstacle. If the car owner finds that a certain car sold by some certain dealer is particularly hard to service, he will look for another make, more easily serviced. The dealer handling this car must then seek some other connection, and gradually in this way, by evolution we will discard the inaccessible and adopt the accessible cars.

But if the automotive business must go through the slow evolutionary process in order to gain accessibility, then indeed, we represent a slow going, sleepy, short-sighted business.

Accessible Design

Why cannot these questions be worked out and solved before the car is sold to the public?

A uniform classification to be used as a basis in car purchase is under contemplation by MOTOR AGE. With it, we have the hope that some day we can correct the evils caused by inaccessibly located parts and make it impossible for a car owner to be charged eighty-nine dollars FOR THE REMOVAL AND REPLACEMENT OF A FAN BELT.

Perhaps it may seem to some that we are exaggerating when we talk of eighty-nine dollar labor charges for the removal and installation of a new fan belt. We have actual records, though, to substantiate this statement.

Even in the small things like grease cup location, wonderful strides could be made. On the M—— car, for example, one grease cup is never filled if the exhaust pipe is hot. The cup is located

(Concluded on page 39)



Group of boys who are taking the two-year course in the Automotive Trades School. Proper training in the fundamentals of automotive repairs will make them the sought-for mechanics of tomorrow

MECHANICS OF TOMORROW

The Automotive Trades School of Cincinnati Is Giving Its Students a Course in Garage and Repair Shop Work

IN Cincinnati, there has been established a school for the training of the automobile experts of tomorrow.

Here in their greasy overalls, bearing all the earmarks of a regular mechanic or repairman, for many of them actually are, one will find them hard at work—some as young as fourteen, others well along in years. Some are being prepared for placement in the garages and repair shops of Cincinnati, some are already employed in these shops and are accumulating the class-room knowledge that does not come through the shop, and some are owner-drivers who want to know more about the mechanism of their own machines.

Such is the Automotive Trades School of the Cincinnati public school system, a public institution that is conducted by the Cincinnati Board of Education without profit, under the Smith-Hughes vocational training act by which most of the expenses are paid by the State and National Governments. Tuition is free to the residents of Cincinnati; non-residents pay a nominal fee.

Started in co-operation with the automobile men of Cincinnati in December, 1918, as an outgrowth of the soldier-

mechanic training courses of war times, the school was begun as an experiment with an initial enrollment of eighteen students. Six months later it had an enrollment of 300 and a waiting list. It re-opened last fall with a first day enrollment of 350, its capacity, and a waiting list, and it has held this waiting list, which has run as high as 350, throughout the year.

It was instituted primarily as a school to train boys of fifteen to nineteen years old, who were leaving school, for the automobile industry. Its success has

***I**T IS estimated that more than \$500 has been saved on the Cincinnati Board of Education cars by work performed by the students of the Automotive Trades School which is a part of the public school system. The co-operating agencies supporting the school are the Cincinnati Automotive Trades Association, Cincinnati Automobile Dealers Association, State Automobile Trades Association and one or two other organizations. The average cost of the day course per student is \$83.02, while the night course averages \$14.25 per student.*

been so remarkable that it has taken in a much larger field and now is maintained for the man as well as the boy.

There are, in fact, two complete schools. The day school is for boys and has an enrollment of 100. The course offered them is a two-year course which gives them a rating as apprentices. They divide their time between class-room and school shop work during the first year and, in the second year, spend twenty-six weeks in the school and twenty-six weeks in the automobile garages of Cincinnati on a co-operative plan, which has been unusually successful. It has been so successful that many of the boys start out in the shops as regular employees before they are graduated. This school meets fifty-two weeks a year.

The night school is for men of three classes—those already in the trade, those wanting to get in, and the owner-drivers. The night courses are made up of eighteen distinct five-week units, each of which treats of a particular phase of the work. An applicant may take one or more of these units—each of which lasts five weeks, two nights, four hours a week.

AUTOMOTIVE TRADES SCHOOL																																							
Last Name		1--Repair Methods		Date Enrolled																																			
First Name		2--Chassis		Nights Preferred																																			
City		3--Engines		Card Granted																																			
Street		4--Ignition		Diploma Granted																																			
Telephone		5--Service		Date Discharged																																			
Occupation (Give Details)		6--Vulcanizing		Tradesman																																			
		7--Battery Work		Beginning Tradesman																																			
		8--Accessories		Owner Driver																																			
		9--Salesmanship		Previous Schooling																																			
		10--Motorcycle		Ability		Speed		Initiative																															
		11--Engines, Advanced																																					
		12--Electrical, Advanced																																					
		13--Service, Advanced																																					
		14--Vulcanizing, Advanced																																					
		15--Battery, Advanced																																					
		16--Motorcycle, Advanced																																					
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		Units		1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18	
		Selected																																					
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		Completed																																					
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		Tuition																																					

11-1918-3M Washington School Press

This is one of the enrollment cards used by the Automotive Trade School of Cincinnati. It gives the student's record and his progress at a glance. It will be noted that the card was printed by the printing class students at another Cincinnati school where printing is taught

While the day subjects are English, civics, drawing, shop work, etc., the night subjects are principally lectures and shop work, and the school is in session only thirty weeks a year. The courses that are given in five-week units are: Garage shop repair methods, chassis work, excepting engines; engines, electrical and gasoline systems, service work on cars from the road, vulcanizing, battery work, accessory man's course, automobile salesman's course and motor cycle care and repair. Advanced courses are given in most of these subjects in additional five-week units.

A typical unit of the night school is that of garage shop repair work. It covers soldering, sweating, brazing, burning, oxy-acetylene welding, forging, hardening and tempering, filing, sawing, drilling, use of taps and dies, lathe work, bearing scraping, grinder work, care of air compressors, use of hand tools and general repair shop methods.

Students of Three Classes

The students of this school are divided approximately as follows: Already in the trade, forty per cent; wishing to get in, forty per cent, and owner-drivers, twenty per cent. The owner-drivers include some of the more prominent professional men of the city.

To make sure that the instruction is of the best, special efforts were made to get the best instructors obtainable, by John F. Arundel, director of the vocational work in Cincinnati, and Ray F. Kuns, principal of the school.

An instructor in vulcanizing was sought. Kuns went to the largest automobile dealer in the city and asked the name of the best vulcanizer in Cincinnati. He went to another large dealer and a third, and put to each the same question. Each mentioned the name of the same man—Charles Shields, of a local rubber concern. So Shields became the instructor in vulcanizing. The work is at night four nights a week and does

not interfere with his regular day duties.

In the same way a full complement of nine instructors was obtained. John F. Biehl, Professor of Science and Electricity at the University, is an instructor; Frank Buerkle, former service director of a large Cincinnati automobile concern, is another; Ralph Moffett, of a local engineering firm, another; Edward Bathgate, of the municipal garage, another, and so on.

The equipment for the school was purchased outright by the Board of Education, at the request of Director Arundel, when the soldier-mechanic courses were abandoned. This machinery is as representative as could be obtained and is in first-class condition. It has been supplemented from time to time by donations until the equipment is thoroughly complete.

It consists of two kinds—automotive and shop. The automotive equipment in-

cludes six typical engines, four motorcycles, several automobiles in more or less damaged condition for experimental purposes, chassis, etc. The school does all the work on the automobiles of the Board of Education. This is charged as cost prices, giving the students experience in figuring actual costs of materials and labor. Some commercial work is done, but this is not encouraged, as the school does not wish to compete with outside shops. What commercial work is done is taken with no guarantee of a definite date for return. Some wrecked automobiles have been purchased and completely rebuilt in the school.

The shop equipment includes all equipment necessary for the work that is done. The tool room is equipped with new tools and a model check system. This system is a feature of the school, because by it the students are taught the proper use of each tool, and its care.

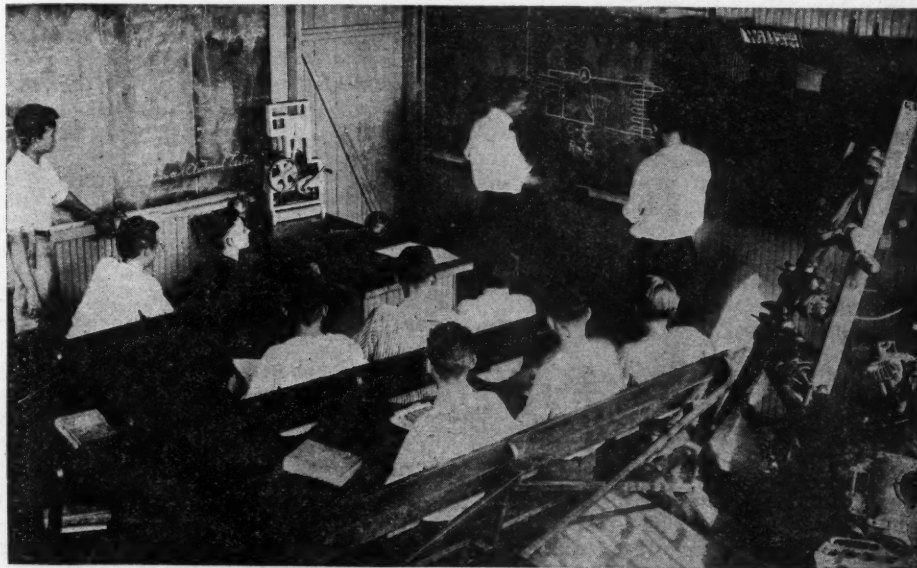
Capacity to Be Increased

The school now has a floor space of 7700 sq. ft., which is taxed to the limit. Because of the overcrowded condition, sections are divided by wire screens to prevent intermingling of classes. Director Arundel and Principal Kuns are attempting to secure new quarters so that the school may be expanded to a desirable point and the students handled more effectively.

The school is being operated with full co-operation of the automobile dealers and garagemen of Cincinnati. The Automobile Trades association has appointed a standing committee of three—a garage man, an accessory man and a tire man—to co-operate in the training of the students and to help place them after they leave. So far no trouble has been experienced in placing any of the students who have made good.

It is not an uncommon occurrence for one of the big dealers to send some of his men to the school for class-room and lecture experience in certain phases of

(Concluded on page 39)



One of the study rooms in the Automotive Trades School. Note the equipment used for class room demonstrations

A COURTESY ENGINEER MEETS YOU AT THE DOOR



Front of the Auto Electric & Service Corp., Detroit, where courtesy has played a big part of their success

The Sole Duty of the Courtesy Men Is to Give the Customer Such a Warm Greeting That He Immediately Feels He Is in Good Hands

THE opening of the new service station of the Auto Electric & Service Corp. at 45-51 Selden Avenue, Detroit, illustrates strikingly the result to be achieved from service efficiency. And the same constant application of effort that brought about this company's development from a small concern, occupying the proverbial 2x4 room, to a position where it ranks as one of Detroit's big industries is as thoroughly a part of the administrative routine as in the corporation's swaddling clothes days.

Devoted to starting, lighting and ignition service, and to the distribution of the product of leading parts manufacturers, the company's force of forty-five is kept on the jump constantly. D. W. Burke, president, G. M. Tobias, secretary-treasurer and E. A. Dunlap, plant superintendent maintain constant supervision over the plant, and every job that goes out of the shop either from the service room direct to the automobile, or over the counter to the customer is assured of 100 per cent efficiency. Dunlap takes direct supervision over the service department.

Naturally the first step on the part of the company is attracting the customer. This is taken care of by circular letters, to owners whose names appear on the state license list, by vigorous newspaper advertising and billboard campaigns. The second step is serving the customer in such a manner as to assure his continued friendship.

The customer attracted by the letter or advertisement is met at the door by

two courtesy men, whose sole duty lies in giving the patron such a warm greeting that he quickly becomes imbued with the feeling that he is in the hands of his friends. One of these men, both of whom are possessed of personalities calculated to inspire friendship and confidence, is an expert engineer. His duty is that of the physician called to attend a patient, who is ignorant of the fact of the doctor's identity. While he is greeting the customer his eyes take in all parts of the car, he lifts the hood, tinkers with the lights and the throttle, and by the time the introductory pleasantries are concluded he feels well satisfied that he understands the condition of the car. Without apparent effort he has diagnosed the ailment.

Repairs Explained to Owner

Satisfied in this knowledge when the customer announces that something is not working right with his tail light, or his spark plug, the engineer tells him exactly what is the matter, and in frequent cases tells him of other repairs that are necessary to put the car in first class condition. The many troubles unknown to the owner, are explained to him by this courtesy man, and the customer's order for the necessary repairs is filed.

After the engineer has shown the customer the real trouble and in many instances, with the most modern testing equipment at hand, he has shown the customer by actual test that his diagnosis was correct, the engineer writes the in-

structions on a shop card, a duplicate of which goes to the office and a claim check containing the same job number goes to the customer.

The cost of the replacements and repairs are figured and taken to Dunlap for his O.K. The customer then is informed what the charges will be and is told the exact hour and minute when he can get his car, or when he can get the part undergoing repair in case it was taken over the counter. The idea of promptness is stressed, and a card in front of the telephone operator shows the hour and minute when every job is due to go out. This operates to advantage in cases where owners have sent in cars with instructions for repairs, and who later call up to know when they can expect the work to be done. There is no time lost in office or shop. The telephone girl simply glances at the card and tells Mr. Jones his car will be ready at 4:15 o'clock, and it is an inviolate rule of the company that every car must be ready to be driven from the shop on the time scheduled.

Another rule that maintains throughout the plant is that every part that is installed must be genuine. No pirate parts find place in the shop.

The shop and store-room equipped with modern machinery, steel cabinets and bins in the store-room, and testing machines that are the last word in efficiency, are flooded with daylight, the building being practically glass on three of four sides. The building, a one-story structure with skylight, is well adapted to the business. Steel lockers for employees, modern and sanitary and tile wash-rooms are in keeping with the cleanliness that is apparent throughout office, store-room and garage. Despite the fact that scores of cars drive in and

out every day, the employees in the garage wear clean clothes and their hands at all times are kept clean, eliminating chance of spotting the upholstery or the carpet or enamel on any car. In the shop proper wherein all repairs are made, after the part has been removed from the car in the garage and also in the store-room, the same admonition for cleanliness prevails. Close supervision is the keynote, and the shop and garage foremen are as keenly alive to the company's requirements in that regard as are the officials.

The garage is manned by mechanical experts, and the garage and shop employees checking against each other minimize the chance of improper work. The parts taken from the car in the garage are taken to the shop window, there receipted for by the shop foreman, who tags that part with the customer's number and then proceeds to have the repairs made as designated on the shop card furnished by the engineer. The shop foremen, like Dunlap, knows approximately the amount of time that should be consumed in the particular job, and looks to his employee to have the part ready when that time has elapsed. The part then is returned to the garage foreman, who in turn summons the man or men, who removed it, and it is replaced in the car and given a thorough test before the final order is written by the foreman.

One secret of the institution's success lies in the spirit of harmony and hearty co-operation permeating the entire organization. Officials of the company operate on the principle that the men are working with them and not for them. So successful has this democratic attitude proved that there is never a lack of expert workmen in the shop, and in fact there is a waiting list of more than 75 names of mechanics, who have signified a desire to get into the organization, many of them willing to leave good positions they now are holding.

Dunlap holds weekly sessions with his employees, generalizing on various subjects. He dwells chiefly on practical operations and the fundamentals, side-stepping, insofar as is possible, the technical details, leaving that to the efforts of the employee. Text books and information gleaned from long experience by men in the industry are used to explain the details of overcoming obstacles that present them-

selves in the shop from time to time.

In the matter of wages company officials put that squarely to the employee. His record is scrutinized carefully, and his wage goes up along with his productive effort. When the production curve begins to near the salary the employee is given a heart-to-heart talk, which usually results in stimulating him to greater effort. The employee is urged to master the technical and engineering

One secret of this institution's success lies in the spirit of harmony and hearty co-operation permeating the entire organization. Officials of the company operate on the principle that the men are working with them and not for them. So successful has this democratic attitude proved that there is never a lack of expert workmen in the shop, and in fact there is a waiting list of more than 75 names of mechanics, who have signified a desire to get into the organization, many of them willing to leave good positions they now are holding.

details for himself, and is given every opportunity to develop his desire for knowledge along that line.

The method pursued in checking in and out the customer's job, whether he drives in or sends his defective part by messenger is a simple, but absolutely accurate system, the chief feature of which is the fact that the customer knows exactly what time was spent on his job, and what parts were replaced. The report of the garage foreman, the requisitions on the stock room, the repair time

in the shop are listed in order and sent to the cashier, who makes out the bill ready for presentation when the customer returns. The envelope containing all of the detail information connected with the various processes necessary to the job then are filed, and in case of controversy can be located quickly, and the particular item over which there may be some disagreement is shown to the customer. Another feature that carries weight with the customer is the returning to him of the defective part taken from his machine.

Dunlap takes a somewhat different view of the mechanic's end from that of most executives. His theory is that if his men are working constantly the best service cannot be given to a customer's job. To make it plain, he contends that sufficient force should be available at all times to give every customer the maximum of time necessary to give him a 100 per cent job. That means necessarily that some of the mechanics must be idle portions of the day. The productive hour subtracted from the total of work done gives the percentage of loss in time, and Dunlap contends that 82 per cent is a fair average. If it goes above that figure he argues that it is bad for the customer, in that he has not been given maximum efficiency.

On the other hand, if the loss in time reaches 25 per cent investigation then is instituted with a view to determining whether there is a surplus amount of labor employed. The theory is simply that the shop cannot give best service if loaded at all times, at the same time, the non-productive time must now show a percentage higher than 20. Experience has shown the amount of time that should be consumed on every replacement. Overtime, however, frequently is necessary, due chiefly to the inexperience of the customer, who has tinkered with his own car, or the result of the efforts of a garage man, who was not thoroughly familiar with his duties.

Absolute check on the overhead and the net revenue is made possible by a rather elaborate system of indexing each day's efforts. Each particular job is listed with the number of hours spent on labor, the various parts replaced and their cost, the approximate cost of overhead, and the auditor at the end of each day can tell almost at a glance exactly what net



The Auto Electric & Service Corp. rightly believes in plenty of light and takes advantage of every bit of sunlight possible by their large skylights. While there are always many cars in the shop at one time, because of the orderly arrangement, there is no confusion and they have plenty of room to move them

exactly what net

Keeping Record of a Job in the Auto Electric and Service Corp., Detroit

Form 1

JOB ANO 7167

Instructions: *See not charging has grounded armature Put this shop. At Condition. Check Ign. Repair tail light.*

Rec'd by: *John Jones* ANO 7167

Name: *John Jones* C.O. *3353*

Street: *12 W. Euclid* Phone No. *3353*

City: *Detroit* Article: *Model R-1 Hupp*

Car: *Hupp*

Instructions: *Same as above*

Form 2

Customer: *John Jones* A NO 7167

Street: *12 W. Euclid* Phone: *3353*

City: *Detroit* C. O. No.

LABOR Article: *Model R-1 Hupp*

Date: WORKMAN: Hours:

Total Labor Billing:

Form 3

JOB A NO 7167

MATERIAL REQUISITION CARD

No.	STYLE	DESCRIPTION	LIST PRICE
1	230797	Armature	21.00
1	2nd	brush	25
2	2nd	brushes	60
1	760	bearing	1.05

Stockkeeper: *O.K.*

Form 4

REQUISITION ON STOCK ROOM

DATE: *3/18/20*

Job No. *7167*

QUANTITY	DESCRIPTION	MAKE
1	230797	Armature
2	2nd	brush
1	760	bearing

Signature: *Chase*

Form 5

THIS CARD MUST BE MADE OUT ACCURATELY

Date: *3/18/20* Job No. *7167*

Name: *B. White* Employee No. *14*

DESCRIPTION OF WORK DONE IN DETAIL: *Removed & tested armature found to be grounded. New armature drawn from stock. Also new brushes & bearings. Assembled, tested & performed.*

Time Begun: *9:00* Time Ended: *11:00* Elapsed Time: *2*

Form 6

THIS CARD MUST BE MADE OUT ACCURATELY

Date: *3/18/20* Job No. *7167*

Name: *H. Powers* Employee No. *14*

DESCRIPTION OF WORK DONE IN DETAIL: *Put on gen. Repaired tail light. Checked ign. Tested Performance OK.*

Time Begun: *1:00* Time Ended: *1:45* Elapsed Time: *45*

Form 7

THIS CARD MUST BE MADE OUT ACCURATELY

Date: *3/18/20* Job No. *7167*

Name: *Joe Clarke* Employee No. *17*

DESCRIPTION OF WORK DONE IN DETAIL: *Pulled gen. Turned motor fair slip.*

Time Begun: *8:00* Time Ended: *8:30* Elapsed Time: *1/2*

Herewith is presented a sample job order at the plant of the Auto Electric & Service Corp. Form A is the envelope kept on file in the office. Form C is the material requisition card on file in the stockroom. Form B is the triplicate card with instructions to the shop, a duplicate for the office with the owner's name, address, telephone number, type of car and the customer's claim check. Form E is the workman's requisition on the stockroom for parts necessary in completing the job. Form D shows the records of the various employees in completing the work.

revenue has accrued, and the actual cost of production.

"We believe," said Dunlap, "that our success in a great measure is due to the courtesy men at the door. This is true particularly of our expert engineer, who serves in the capacity of door man, in that a customer feels absolute confidence that his trouble has been carefully diagnosed, and is highly satisfied with the result when the job is completed.

He can't be expected to know every detail of the mechanism in an automobile and very naturally when some trouble of which he is not aware is explained to him before work is started on his job, he feels that the man telling him knows what he is talking about, and the customer in all cases is distinctly appreciative. The cost of the courtesy men, and particularly the engineer, is more than compensated for from the return in

appreciative and pleased customers."

The budget system for labor that has been inaugurated in several service stations, does not appeal to Dunlap. His argument is that with the knowledge of the time necessary for every job that comes into the shop and constant supervision of the foreman coupled with loyalty and co-operation of all employees makes the budget unnecessary. Certainly his system has proved highly successful.



Shop view in the Beverly Garage, whose owners are firm believers in up-to-date equipment. Not the cleanliness and abundance of light

A Simple Record of Each Car

The Beverly Garage, Staunton, Va., Knows At All Times What Has Been Done On Customers' Car

EFFICIENCY is often an elusive article and must be studied to attain it. This is a story of how it was obtained in the Beverly Garage, Staunton, Va.

While no line of cars is handled, a full stock of accessories is carried, the shop in front serving also as office. The latter requires but small space, the system is worked down to the last word in simplicity, importance of which was taught in the pioneer days.

One partner worked out the service station system, basing it on experience of many years in work of this kind. It is simple, yet it keeps the company informed of just what has been done on each car, what may be expected, and is a running record of efficiency not always obtained by those who strive for it. Its efficiency will be apparent from the fact that it accounts for well over 300 jobs a month, and during the past year fully triple of the one before.

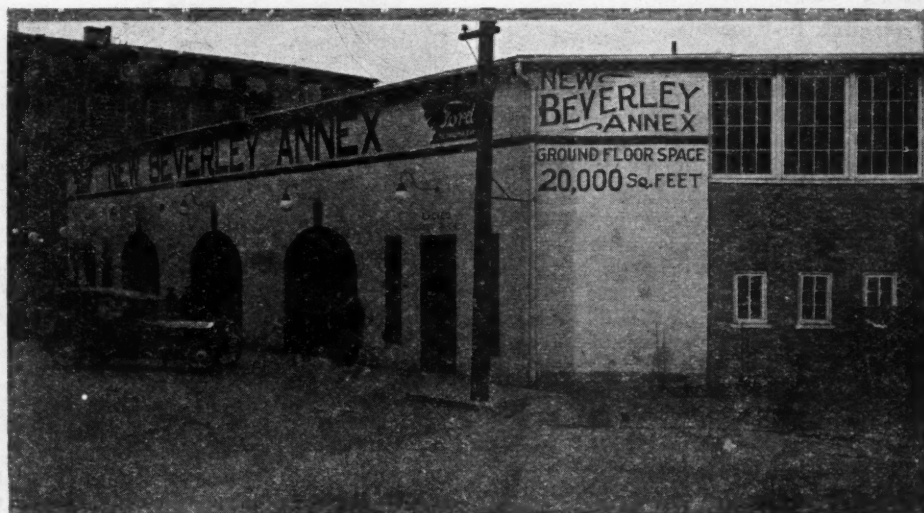
The service station is divided into two sections, receiving and delivering, each in charge of a foreman. Being relieved of all details and manifold duties of receiving and inspecting, the shop foreman can give his undivided attention to shop work. In all service repairs, no matter how small, the regulation work card is used.

Often in going over a car, the practiced eye of the receiving foreman will detect unsuspected faults which can be repaired at small cost if found in time.

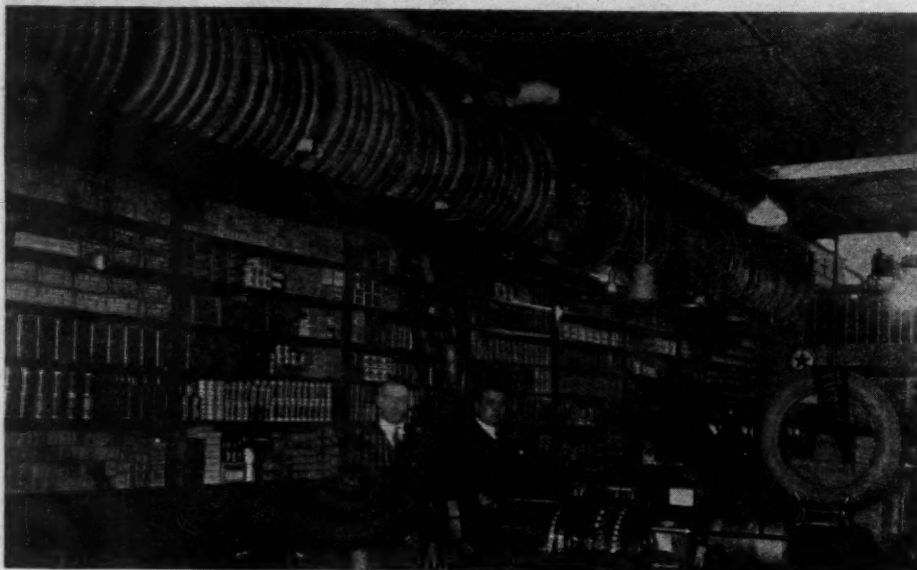
All material used by the workman has to be secured on written requisition signed by the foreman, and in this way an absolute check is kept on every work-

man, leaving no evasion for any possible come-back, since the workman's number appears on the card of the requisition. The latter is in two parts, the original being left in the stockroom, while the duplicate goes in an envelope into the car along with the work card.

Opposite all the items on the repair



This is the service station of the Beverly Garage, which is divided into two sections, the receiving and delivering. On the right is a ladies' rest room



View in the accessory department of the Beverly Garage. The cash register shows that this concern has departmentized its business

card having to do with the greasing or oiling, there are numbers. This is a little time-saving device for entering into the book. Numbers are entered to distinguish from the ordinary repairs and saves much writing, yet it is just as effective, if he at any time refers to the work-card file for information.

When the work on the repair floor is finished, the foreman goes over it carefully and puts his O. K. in the column reserved for him. His inspection must cover thermostat, oil-pressure, choker level, clutch, foot-brake and windshield, whether work has been specified or not. When the car leaves the shop, the work card is filled out with time of beginning and ending of each job.

A table of two-inch planks occupies nearly the whole right side of the battery storage room, fifty by forty feet. This table is against the wall about two and one-half feet high. At the front, in the light from the window, is the switchboard, to which comes the alternating current from the city wires.

Protecting Instruments

For each rheostat is a small shelf, on which the operator may lay his hydrometers and other paraphernalia. These shelves keep the delicate instrument off the charging table, where they would meet disaster.

To the right of the charging table is an old screw copying press, which is used to flatten out and straighten bent lead battery-plates, and serves the purpose admirably. At the rear is a sink for washing out batteries and plates, a work-bench and a gas-stove with a sheet iron over it, and connected to the chimney by pipes, for melting the sealing composition in the tops of batteries. A notable feature of the work-bench is a marble slab eighteen inches by four feet, giving a clean surface to work on. To the side of the stove is the lead-burning bench, with raised shelf for tools, with the two gas tanks at the opposite end,

where they are within easy reach. On the other side of the tanks is a work-table for placing tools during lead-burning operations.

Shelves divided into pigeon-holes occupy most of the left wall, for holding battery plates, jars, boxes, battery supplies and batteries of all kinds. A ledge a foot wide extends at a height of three and one-half feet, making a handy assembling shelf when picking out parts from the shelf above. The shelves are heated in winter by a stove at one end, the ventilation for gases is secured through doors and windows at both ends.

The firm's system of bookkeeping is based on, and follows almost in its entirety, that set forth by the National cash register. The machine used is the reg-

ister No. 855-E-L, the mechanical marvel that has been worked out for the uses of garages alone. It is the highest form of office system in this business that could be obtained, with 45 keys, 1 cent to \$99.99; six clerk's keys and three special keys, total added, receipt and detail strip printer, and special lever numbering device.

Record of Each Clerk's Sales

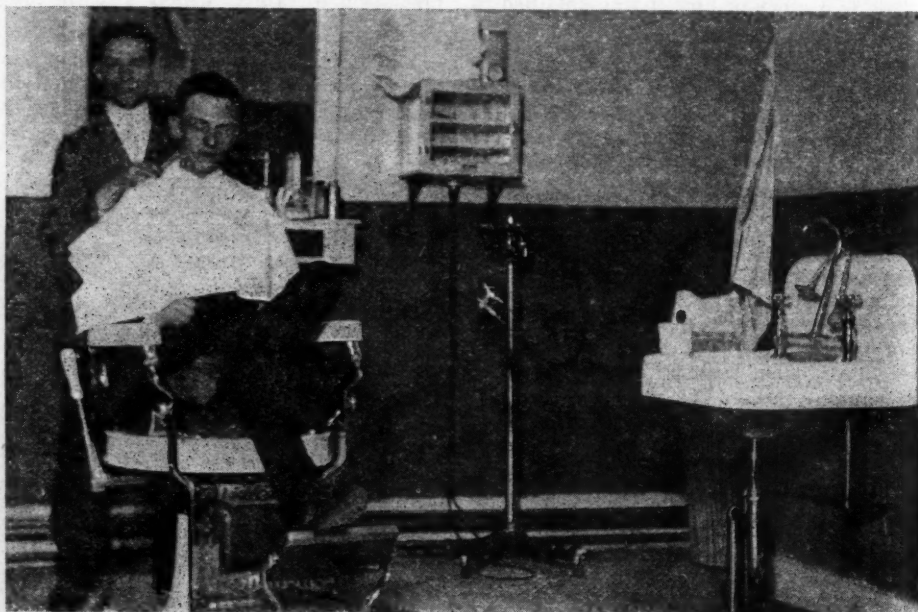
Every customer is provided with a receipt, 200 per cent faster than it could be done by hand. An accurate account is kept of each clerk's work, for each punches his own key, and his letter appears on the strip printer. The nature of every transaction is kept. For instance, if the transaction is charge, for \$3.00, and is for one gallon of gasoline, one quart of oil, and repair work, say vulcanizing, and is put through by a clerk A, then the receipt reads:

VIRGINIA GARAGE

Ch. A. 3.00 Vul. Qu. 1

Thank you. Call again.

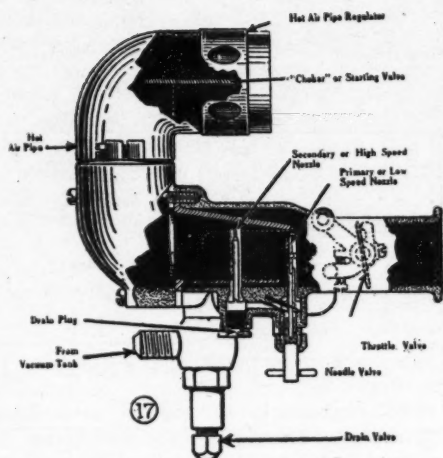
The legend at the bottom or top can be as the owner wishes. On the back is his business card. But no matter what the nature of a transaction, its exact nature is printed. The detail for office reference records each entry in the order in which it is made, whether cash or charge sales, money received on accounts, or petty paid-outs. Thus, at the end of each day, the partners can, if they so desire, review the day's business in half an hour or less. They know how much gasoline and oil they have sold, and can easily find how much is in the tank, and how much work and of what nature each workman has done, how much money has been taken in and how much paid out. They can tell almost at a glance how many customers have been served and in what manner.



For the convenience of members of the Maxwell-Chalmers Sales Corp., Philadelphia, and dealers who may happen to make trips to the sales headquarters, a thoroughly up-to-date barbershop has been established on the second floor. The shop is a novelty in automobile circles in the East, if not in the entire United States, and it makes it possible for a man to conduct his motor car business and get "dolloed up" at the same time.

ADJUSTING THE CARBURETER

The Third of a Series of Articles on the Adjustment of All Makes of Carbureters Used as Standard Equipment on All Cars. Makes Using Their Own Carbureters Are Taken Up Individually



Tillotson carbureter. The dotted lines show the position of the flexible reed valves

WHILE the Tillotson carbureter is essentially an air valve carbureter, its construction and operation are quite different from the ordinary air valve carbureter. In this carbureter two steel reeds are employed, which open away from each other as the engine speeds up and consumes more mixture. Fig. 17 shows a sectional view of this carbureter. The restriction at the small end of the valve is predetermined to equal the requirements of the engine at slow engine speeds, and at that point is located the primary fuel supplying nozzle, and that nozzle is provided with an adjustment.

The secondary nozzle, it will be noticed, is located farther back, and open to atmosphere so that no gasoline is drawn from the secondary nozzle at the slower engine speed.

As the throttle is opened and the engine speed increases the two flexible, yielding steel spring reeds open outwardly in proportion to the throttle; as the engine speed is increased, the arc through the air valve is increased in size, then the secondary nozzle commences to deliver fuel into the path of air at some open position of the throttle, and continues to deliver fuel at all higher engine speeds, and discontinues delivering fuel as the throttle is again closed and engine speed reduced.

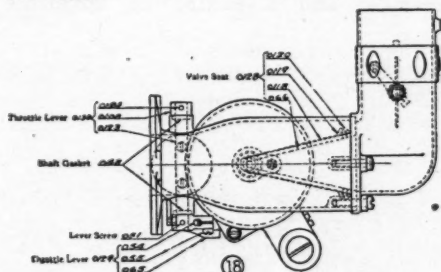
The primary nozzle feeds the required amount of fuel at all slower engine speeds, and reaches its maximum volume at a partially open throttle and continues to feed this maximum amount during the full range of engine speeds; therefore, a single adjustment of the primary nozzle affects the mixture at all engine speeds.

The air valve, having the proper re-

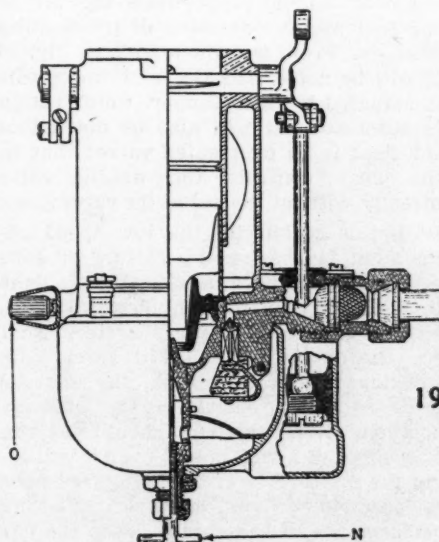
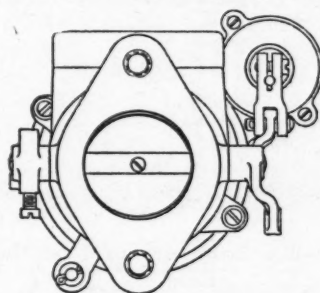
striction for slow engine speeds, and having its area equal to the maximum, does not, therefore, need an adjustment, as the fuel adjustment is sufficient.

The adjustment should be very carefully made, and only when the engine is well warmed. A very slight change of the adjusting needle is effective, and too far open will spoil the economy.

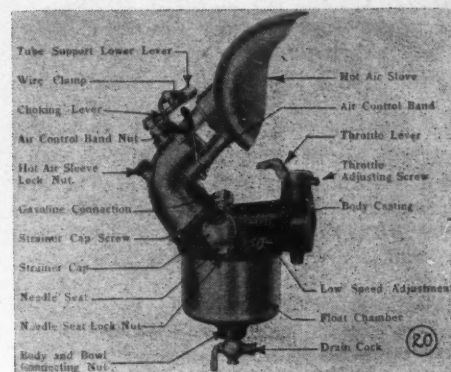
Turn the adjustment of the primary nozzle up to the right just a little at a time, and keep turning it until the engine commences to slow down from lack of fuel, then turn it back about one-eighth of a turn, avoiding getting the mixture too rich.



Top view of the Tillotson, showing the reed valves, which are automatic



The Johnson carbureter, which is of the concentric float type



The Carter carbureter

The fuel chamber of the Johnson carbureter which is shown in Fig. 19, is located directly below the fuel valve, or in other words this carbureter has a concentric float chamber. A cork float is used which is shaped much like a doughnut, which surrounds the valve. The path of the gasoline is from the float chamber through the cross hole near the bottom of the nozzle and is delivered to the mixer chamber through the strangler tube. The air enters the mixer chamber through the opening extending from its side, from where it divides; a part passing downward around the bottom strangler tube and the other part passes around the lower edge of the sleeve where it meets the whirling spray coming from the strangler tube.

There are eight steps in the adjustment of this carbureter and they are as follows:

First. Close the needle valve "N" tight.

Second. Open the needle valve "N" $1\frac{1}{2}$ to $1\frac{3}{4}$ turns.

Third. Flood carbureter by working throttle lever up and down quickly three or four times.

Fourth. Advance the spark lever $\frac{1}{3}$ to $\frac{1}{2}$ way on the sector.

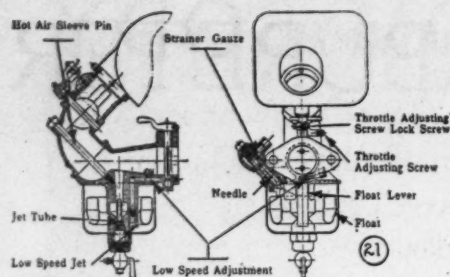
Fifth. Start the engine.

Sixth. Readjust needle valve "N" to obtain best results at high speed.

Seventh. Close throttle and adjust needle valve "O" on forward side of carbureter for low speed.

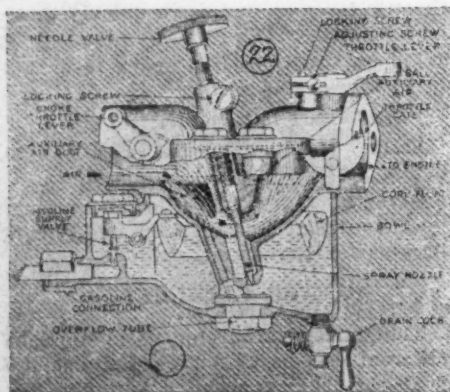
CARTER CARBURETER

The Carter carbureter used on eight different cars is of a type that has the float chambers concentric with the low speed and high speed nozzle. The two illustrations, Fig. 20 and Fig. 21, show the exterior and sectional views respectively of this make. It will be noted from



Sectional view of the Carter carburetor, showing the positions of adjustment

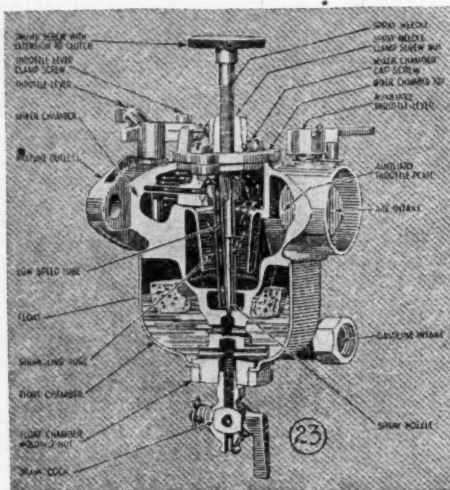
the sectional view that venturi chamber or passage is a part of the shell of the carburetor. There are two adjustments on this carburetor, one for low speed and the other for acceleration. The low speed adjustment produces a lean mixture when the low speed screw is turned in, and rich when turned out. The proper adjustment is obtained by listening to the operation of the engine and also by examining the exhaust and determining from this whether or not the mixture is too rich. The acceleration adjustment is an adjustment that controls the float level in the fuel chamber. This adjustment is accomplished as follows: First, the gasoline at the main tank is shut off; second, the cap screw which secures the strainer to the carburetor should be loosened; third, the needle seat lock nut should be loosened; fourth, the needle seat should be turned to the right or to the left until the level is correct; fifth, the operation is reversed, the needle seat tightened at the same time holding the needle seat in place with another wrench; sixth, the screw is replaced which secures the strainer making sure the gaskets are in place and that this screw is properly tightened to prevent leaking at the joints. In making this adjustment it should be clearly understood that turning the needle seat out raises the float level while turning it in lowers the level. The action of the carburetor manifested by the float level is as follows: If after the engine is thoroughly warm the carburetor back with advanced spark then the level should be raised slightly from this point. If the mixture appears too rich on acceleration it should be lowered slightly.



The Kingston carburetor on the Ford

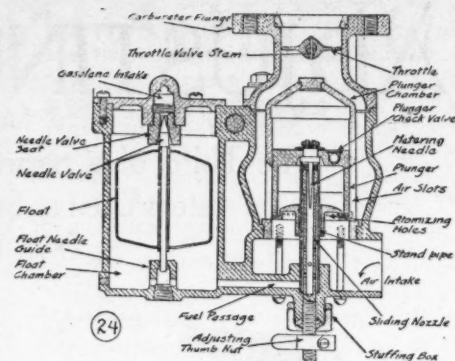
The Kingston and Holley carburetors used for the most part on the Ford car are both of the concentric float chamber type. Each of these carburetors are practically identical in their operation and adjustment. There is but one adjustment necessary, and this can be adjusted from the dash. The condition of the exhaust smoke determines very largely the proper setting of these carburetors. Generally speaking, an approximate setting can be obtained by closing the needle valve entirely and then opening it 10 or 12 turns. After running the engine a while it can soon be determined whether or not this setting is correct and the final adjustment can then very easily be made. The lock nut and screw should then be set up to hold the needle valve in its place.

The Newcomb carburetor, manufactured by the Holtzer-Cabot Electric Co., Boston, Mass., which carburetor is standard equipment on the Holmes air cooled car, is of a type different from those we have considered so far. The Newcomb carburetor consists of a float chamber and a mixing or atomizing

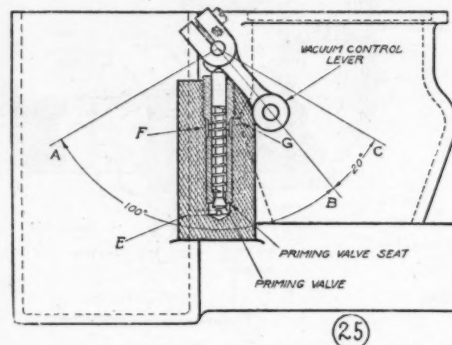


The Holley carburetor used on the Ford

chamber which proportions the air to the fuel by the operating of the floating plunger. From the illustration in Fig. 24 it will be noted that the metering needle is actuated by this plunger, which action is automatic. It will also be noted that the float is an overseated valve; that is, the float controls the needle valve directly without the aid of the valve arms. With this carburetor the low speed adjustment is changed by raising or lowering the low speed nozzle which is done by means of adjusting thumb nut, Fig. 24, on the bottom of the carburetor. Next run the engine idle until it reaches its working temperature when the mixture lever should be moved to its midway position. Next the car should be run at a speed of about 25 to 30 m.p.h., carrying the mixture lever as far toward poor as possible without, however, affecting performance of the engine. Stop the car but allow the engine to idle. The low



The Newcomb carburetor

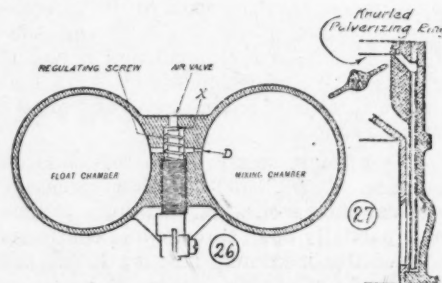


The vacuum control lever of the Newcomb carburetor should be kept as close to position A as possible

speed thumb nut should be turned slowly up or down until the proper idling is now obtained. This setting when correct does not need to be changed except to take care of the extreme changes in temperature, as from summer to winter. After the low speed setting has been obtained the regulation of the mixture is controlled by the high speed lever.

The carburetors used on the Hudson Super Six and Essex car are made by the Hudson and Essex companies respectively. They are of the type somewhat similar to that employed on the Holmes just described, differing only as can be observed from the illustration in Fig. 28. A floating piston is employed to gage the height of the measuring pin, this being the respect of similarity. It will be observed though that on this Hudson carburetor there are no adjustments, except that which can be controlled from the dash board.

One variable which is not properly termed an adjustment on this carburetor is the float level screw which is accom-



The passages within the Newcomb carburetor, showing the air bleeder

DESIGNING A CUSTOM BODY

Problems That Confront the Independent Designer Because of the Traditions and Prejudices of Long Established Carriage Builders

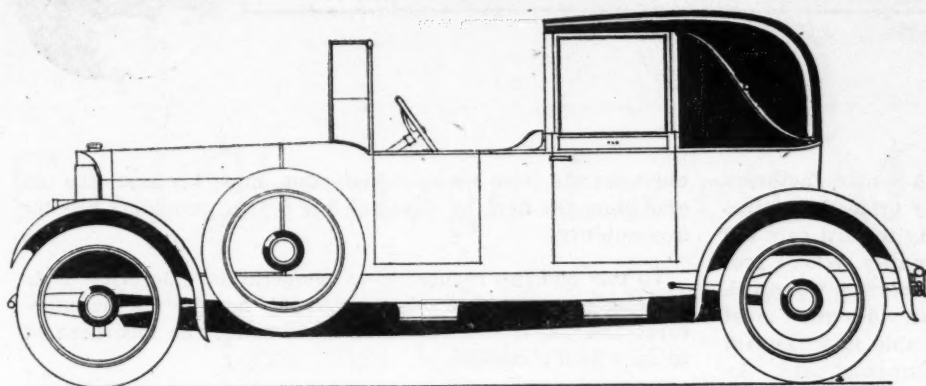


Fig. 1. The original design submitted to the body builder by John Jay Ide, Washington, D. C.

THIS story has been written by one of our readers on the various phases of design of a custom body by an independent designer confronted by the traditions and prejudices of a long established carriage builder. Considering that the body was built by one of the oldest and most conservative coachmakers in America noted for the beautiful workmanship, it is rather an advanced example of the art. It is admitted that the finished body differs from

the design in certain points about which the coachmaker was not open to argument.

This is what the designer has to say: When the original sketches for this body, a cabriolet, were made, it was thought that a certain chassis of 135 in. wheelbase would be used. In order to provide ample body space while keeping the overall height down as low as possible, however, the final choice was a chassis which could be obtained in a special length wheelbase—145 in.

Disk wheels were originally contemplated, but they were later abandoned as not being in character with the type of body. Another "sporting" feature, however, was retained. This was the suppression of running boards in favor of steps. It will be noted that the steps are large enough to be of some use in getting in and out of the car. The individual steps generally supplied by the custom body makes are of the buggy type, so small that one has to carefully feel his way in and out of the car for fear of missing them altogether.

Eliminating the running boards exposed the necessary but somewhat in-artistic mufflers, propeller shaft, brake rods, etc. These have been concealed by

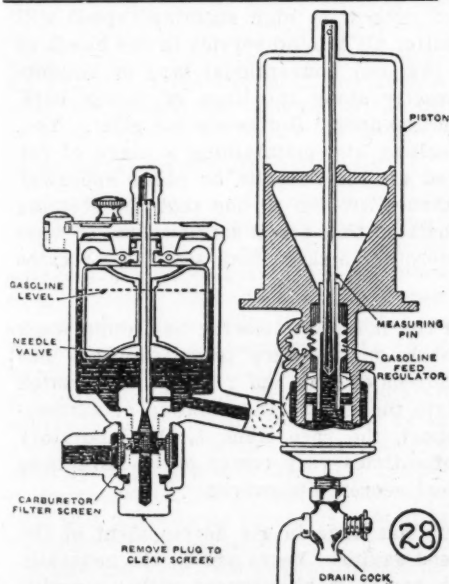
a continuous underpan running from the engine to the rear wheels.

In the original design, Fig. 1, the splash guards of the steps were unobtrusive as they ceased at the bottom of the frame. In the finished body, Fig. 2 they have been carried up to the body at a sacrifice of appearance. Justification for the extraordinary "dustpan" effect thus created may be found in the fact that door lights are poorly set in the rear step guards.

Lights could, however, have been placed under the overhang of the body. The keynote of the design is the combination of the pointed radiator and windshield. Particular stress was laid on the importance of giving both windshield and radiator the same obtuse angle. The coachmaker in his inscrutable wisdom insisted on making the angle of the windshield comparatively acute, thereby accentuating the one defect of the type: allowing rain to drift in between the centre post and the upper glass section when open.

The whole construction of the windshield is too massive, despite all efforts of the designer to have it lightened. The rear door pillars are also too massive, although they have been reduced considerably from the size which the builder wished to use. Outside hinges for the window frames are a sign manual of the builder which he refused to discard.

He finally agreed that no door mouldings be used, as the doors still fit perfectly and no rattles have developed after extended use, we may take it as proved that with first class workmanship door mouldings are superfluous and indeed undesirable from the artistic standpoint. The apparent length of the body being decreased by the four vertical ribs thus introduced. One moulding the writer insisted on—an uninterrupted horizontal line from the windshield to the back of the car.



The Hudson and Essex carburetor

plished by unscrewing the small cap on the top of the float chamber and turning the screw either direction, depending upon the level desired. The metering pin adjustment is controlled by the position of the dash control device. If the float level is noticeably high with this carburetor one is apt to obtain a flooding condition. The dash control gives all ranges of mixture from one extreme to the other; that is, it is possible to obtain a mixture so lean that the engine will hardly run and so rich that the engine will choke. (Article IV next week)

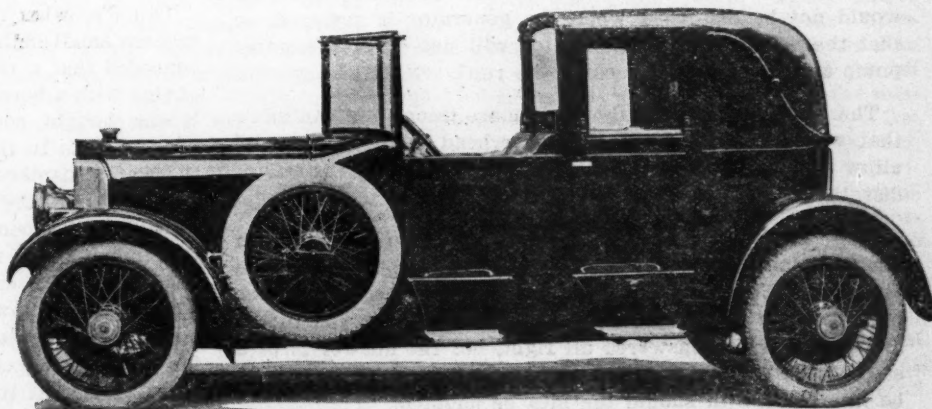


Fig. 2. The finished body, which has slight variations from the original design



EDITORIAL



European Design

versus

American Design

before they compare favorably with the European cars. As far as appearance goes we have the edge by a long way. But in the matter of skillful weight reducing design we can well afford to accept a few pointers from our overseas neighbors.

TAKE as an example the new Hispano-Suiza, a car with a wheelbase of 145 in. The chassis weight of this machine is 2525 lb. Nor is this light weight the only feature about the car. The engine has a bore and stroke of 3.9 by 5.52 in., not much greater displacement than the six-cylinder engines used on most of our lightweight six-cylinder cars, but the horsepower developed by this engine is greatly in excess of that produced by any American engine in stock production. This engine develops 136 hp. at 3000 r.p.m. and 100 hp. at 1600 r.p.m. In American practice, we do not reach horsepower figures of such proportions for similar sized engines. However, if we took time to work out the details we could no doubt make as good a showing.



For Greater Accessibility Application

so placed that you could fill it with water with comparative ease? You would like to see the engine so designed that the tappets could really be adjusted, so that all the main bearing bolts could be reached, so that the ignition timing would not be disturbed when the generator is removed, so that the removal of the generator will not affect the water pump and thus allow the car to be run?

There are perhaps one thousand more things you can name that would cut down the large overhead labor charge and allow you to keep a list of satisfied customers, instead of dissatisfied ones.

Well, the question is, how are we going to prevail upon Mr. Car Manufacturer and make him see these things as you and I do? You have found out that your suggestions to the manufacturer do not prevail. Letters written by you to the manufacturer are answered all right, but the answer is of a stereotyped variety, explaining that regular production would be interfered with should the idea be adopted.

The very foundation of the issue is that the manufacturer

AMERICAN manufacturers can justly pride themselves on their ability to turn cars out in carload quantity. Where production is concerned we excel. But American designs must show considerable improvement

must deviate from regular production, must lay aside the old and adopt the new, by changing his design, providing greater accessibility.

To this end, we request your co-operation. Describe to us some of your troubles. Let us present these to the manufacturer and see if some of these ideas cannot be incorporated in next year's models.



Lessons From the Speedway

ONE of the prominent race drivers of this country once said that the best test that can be given any car is to put it through a 500 mile race on the Indianapolis Speedway. This is no idle statement. Speed spells safety.

It means a car that can endure the abnormal strain, vibration and wear imposed upon it at high sustained speed will last longer and give better all around service in the hands of private owners. Not that our conventional type of automobile must be built exactly along the lines of racing cars. Obviously this could not be done. But here's the point. You, as a dealer, may be selling and maintaining a make of car that never has entered an Indianapolis or other speedway event, and yet the chances are ten to one that the steering knuckle or the axle shaft on that car is safe because of what racing has taught some other maker about steering knuckles or axle shafts.

Racing has inspired the industry. Racing has found weak constructions. A mishap on the race track probably has spared car owners hundreds of lives had a faulty construction been allowed to get into the design and makeup of automobiles generally. In short, the race track is the laboratory where experiments—oftentimes very costly ones—have been made and the analytical secrets discovered.

Think of what racing has done in the development of the modern small high-speed engine. Years ago it was generally conceded that a racing car must be powered with a massive engine with a bore anywhere from 6 to 8 inches. High speed, it was thought, could not be obtained from anything under a 6 inch bore. In the first 500 mile Indianapolis race, in 1911, the piston displacement was for cars up to 600 cubic inches capacity, and the average miles attained was 74.59. The piston displacement has been cut down from time to time so that in last year's race cars of 300 cubic inches or under were eligible. The average miles per hour last year was 87.95, which goes to show that old theory regarding high speeds and large engine bores is completely upset. This year's race is for cars of 183 cubic inches, and the gossip among those knowing is that the speed will be equal to or even surpass that made last year. All of which proves one thing—the wonderful strides made in the development of engines.



Fuel Shortage Latest Motor Problem

Increasingly High Prices of Gasoline and an Acute Shortage in Many Localities Challenges the Attention of the Industry

WASHINGTON, May 18—Notice has been served on the nation that a shortage of gasoline and oil fuels is imminent. The Bureau of Mines, Department of the Interior, points out that little hope can be held out for increased output of liquid fuel. They urge upon the country that "petroleum and its products should be reserved for those uses for which it is peculiarly adapted and for which there are no substitutes."

The production of crude oil has not nor can not keep apace with the consumption of gasoline and other oil products. The Bureau of Mines believes the rapid expansion of the automotive industry and the increased use of oil-burning engines in the merchant marine has taxed the productive capacity of the oil industry beyond the straining point.

Consumption Overtakes Production

Director Manning in a statement sets the facts before the country as follows:

The consumption of all petroleum products has increased at an enormous rate. During 1918 comparatively few automobiles were built, therefore, there was not as great an increase in the automobiles in use in 1918 and 1919 as in previous years. But in 1919, 1,500,000 automobiles were built, which will be in use during 1920, while the automotive industry is more active than ever before. It is, therefore, to be anticipated that 1920 will prove to be a year of enormous consumption of gasoline.

While the year 1920 began with an increasing oil production according to the Geological Survey, the consumption has increased so much faster that in January, February and March it was necessary to take 3,373,000 barrels of crude oil from storage to meet the current needs.

In the United States the yield of the north Texas fields has apparently receded from the maximum and is now on the decline, and unless new fields are there discovered, the production for 1920 is likely to be less than for 1919. Promising fields in Louisiana have proved to be large, but not as extensive as many had anticipated.

ONE of the biggest problems of the motor car industry has recently come to a more general attention than it has heretofore received. This is the fuel question.

Prices for gasoline and oils have been raised in nearly all parts of the country. In some, not only have the prices been raised, but there actually exists a famine of fuels and users are put on what virtually amounts to a rationing basis. The report of the Bureau of Mines printed here, is certain to be of interest to those identified with the industry.

The demand for kerosene continues to be active and the price of kerosene has doubled in a little over a year's time. The price of fuel oil has also doubled.

The U. S. Geological Survey has estimated that over 40 per cent of the oil in all the oil fields has been brought to the surface and used, and it is estimated that the underground reserve is equal to less than twenty years of the present consumption demands.

There are undoubtedly vast quantities of oil to be found abroad, as the rest of the world's territory has not been developed nor prospected as intensively as the United States. Large fields occur in Mexico, Venezuela, Colombia, Persia, Russia, and potential fields are known to occur in other parts of South America, Africa and Asia. Of these fields, those in the Americas are nearly all under the control of Latin-American governments, while the others in other continents are mostly under the control of the British, French and the Netherlands, with the exception of fields in the former Russian Empire.

As far as the United States is concerned, however, the most important sources of foreign supply are in the Latin-American countries, especially those bordering the Gulf of Mexico and the Caribbean, that is, Mexico, Venezuela and Colombia. Mexico contains large quantities of oil which can be readily obtained, provided no restrictions are placed upon the exploitation of those

fields. Oil is present in this region sufficient to meet our needs for many years to come.

Venezuela and Colombia have large resources, which, however, are apparently not as great as those of Mexico. Also, these resources are more difficult to develop, and it will take much longer to put them on a large producing basis than those in Mexico. These are fields from which production in large quantities can be obtained a few years hence, but can not relieve the present situation.

In general it may be stated that the oil from the wells of the United States, in all probability, can not take care of our future needs, but that there is much oil in the world, and it simply is a question of developing it with sufficient rapidity to keep pace with the rapidly increasing demands.

Possibilities of Oil Shale

Oil products can also be obtained by destructive distillation of coal, and lignites. However, if all the coal and lignites mined in the United States were subjected to destructive distillation, this would provide but a comparatively small fraction of our petroleum needs.

The oil shales of the United States, particularly those of the Rocky Mountain districts, contain potential quantities of oil in beds which are richer than those of Scotland, where shale has been resorted for many years. These shales are capable of yielding many times greater quantities of hydrocarbons than have ever been extracted in all the oil fields of the world, according to the estimates of the Geological Survey. But this industry is in its infancy. In fact, it has not yet passed out of the experimental stages. It will take enormous capital, enormous equipment, and enormous energy to develop the oil shales to such a point that they can supply any considerable quantity of our oil needs. Almost as much, if not more, tons of oil shale would have to be mined than coal in order to obtain production of crude oil equal to the present yield of our oil wells. It must, therefore, be many years before this resource can be used.

Oregon Without Gasoline as Gravity Law is Forced Into Effect

PORTLAND, ORE., May 18—Action by the Standard Oil Co. this week in curtailing gasoline sales for passenger cars to 20 per cent of their normal tank capacity, and for motor trucks to 50 per cent of their tank capacity, and the further warning that it may be necessary to cut off passenger cars entirely for several days or weeks, has revealed a serious gasoline shortage. The shortage is attributed by the oil companies largely to the Oregon law which requires that gasoline sold in the state must be of 56 specific gravity.

Six months ago Gov. Olcott averted a gasoline famine by suspending the law to permit importation of several hundred thousand gallons from Washington, which requires no gravity test. Since then a special session of the Oregon legislature failed by one vote to repeal the gravity test and make the Oregon law conform to those of other Pacific coast states, and now the governor says he has no authority to suspend the law.

The Standard Oil Co. has in storage in Portland only 140,000 gallons of 56 gravity gasoline, enough for only 4 days normal supply. It also has 1,000,000 gallons of gasoline for Washington dis-

tribution, but as this gasoline does not meet the Oregon requirements, declares it cannot sell any of it here without written authority from the governor and state sealer of weights and measures. Other companies take the same stand.

Urgent appeals for action by the governor to relieve the shortage by suspending the law, authority or no authority, have been made in a shower of letters and telegrams from all over the state.

Business men of Astoria have wired that their city has only a 3-day supply of gasoline, and that unless immediate relief is obtained the fishing and canning industry, now in the midst of the spring pack, will be tied up completely. From The Dalles, in eastern Oregon, has come word that already hundreds of tractors are idle in the great wheat fields of that section because of lack of gasoline, and this at an especially critical period when spring plowing must be done at once or not at all.

FERRY GIVES NEW ORLEANS EGRESS

New Orleans, La., May 18—The important question of how to get out of New Orleans once you get into an automobile, has been solved, temporarily at least, by the establishment of motor car ferry service across Lake Pontchartrain, from New Orleans to Madisonville and Mandeville, by the steamer Najelda, a 52-ton boat, owned and operated by the Pontchartrain Excursion Co. Two sailings every day are scheduled and ten cars can be carried each way.

Hundreds of New Orleans automobile owners have been unable to get any distance out of the city or to visit the beach

resorts of the gulf coast, owing to the impossibility of making the trip over the existing roads into and out of the Crescent City. Good shell roads, running east and north, touch Lake Pontchartrain at Madisonville and Mandeville, however, and with only about two and one-half hours on the lake, motorists can be in Bay St. Louis, Pass Christian, Biloxi and other gulf coast beach resorts within four hours of their breakfast in their New Orleans homes. Coming south over the same roads, tourists can get into New Orleans now, who have been forced, hitherto, to pass up this city on their motoring trips.

NEW ORLEANS DEALERS HAVE BALL

New Orleans, La., May 18—New Orleans automobile dealers now have a commodious place of their own in which to hold meetings. The convention hall of the Louisiana-Mississippi Automobile Trades Association, and the New Orleans Automobile Dealers' Association, was opened on the evening of May 7, with appropriate ceremonies and refreshments, including beer. Automobile dealers from New Orleans and surrounding towns to the number of 126 attended, and a lively program was rendered.

The hall is at 718 Poydras street, and is on the ground floor, directly back of the offices of the automobile trades association and of the automobile dealers. It is the product of the efforts of both associations, and will be used by both jointly in advancing the interests of the industry and the trade in this part of the South.

VICKSBURG FORMS DEALERS' ASS'N

Vicksburg, Miss., May 18—The Vicksburg branch of the Louisiana-Mississippi Automotive Trades association has been formed, with L. G. Powell as president, and every dealer in Vicksburg enrolled as a member.

NEW YORK GAS PRICES UP

New York, May 14—The Standard Oil Co. has sent out notices announcing that beginning tomorrow the wholesale price of gasoline will be increased from 28½ cents to 30 cents a gallon. It is not expected there will be a uniform advance in retail price to meet this increase. It probably will range from 34 to 37 cents.

The latest increases marks an advance of 6 cents in the wholesale price in the last four and a half months. Prices also will go up in other parts of the country. One year ago motorists were paying 27 and 28 cents retail for their gas.

Still higher prices for automobile fuel have been predicted for months because of the shortage of crude oil but it has been asserted by the petroleum and automotive interests that it would not rise to the levels forecast in some quarters. Committees representing the National Automobile Chamber of Commerce, the Petroleum Institute of America and the Society of Automotive Engineers are working out ways and means to enlarge the supply of gasoline but no report has been made on what progress they are making.

BUFFALO DEALERS ELECT

Buffalo, May 18—At the annual meeting of the Buffalo Automobile Dealers Association it was decided to admit accessory dealers to membership. E. H. Baker, E. C. Bull, J. J. Gibson, C. F. Munroe, E. G. Oliver, George Ostendorf and Albert Hertzog were elected trustees. Deputy Secretary of State Gus Miller addressed the meeting.

Spokane Motor Car Association in Reorganization of Its Activities

SPOKANE, Wash., May 18—Reorganization of the Spokane Automobile Chamber of Commerce to include men aligned with associated industries, refinancing of the plan of co-operative membership to equalize the monetary burden and the broadening of the scope of the organization to make it possible to get behind industrial, irrigation, live stock, financial and agricultural development of the Inland Empire has recently been the uppermost idea in minds of automotive leaders of Spokane.

Under the leadership of the executive committee, comprising Earl C. Finlay, Guy E. Riegel, R. F. Blackwell, Harry L. Olive, W. L. McCabe and Edgar M. Stock, these results have been achieved, the members gathering in a series of meetings to sanction steps worked out by the trail blazers.

Meetings have been fiery, yet all have been directed toward achieving these results:

Simplifying of the used car appraisal situation for the protection of the eventual purchaser of used cars.

Service systems that will at once protect car owners and motor car dealers from the aggravating results of overcharging.

Elimination of the curbstone salesman. Clarifying the automotive atmosphere of the gambling influence injected by speculators who attempt to deal in cars on momentary inspection.

Centralizing of efforts of dealers by making headquarters of the automobile chamber of commerce the clearing house for all used car and other automotive information.

The inauguration of a systematic campaign of education among Inland Empire motor car owners and dealers, the object being to emphasize the fact that Spokane distributors offer every means of co-operation.

Placing the motor car industry of

Spokane on a financial basis such that its solidity can not be questioned by suggestions of luxuries and monetary "joy-riding" impulses.

Meetings of dealers have resulted in bringing automotive leaders into closer harmony, developed for the protection of the automobile purchaser as well as for the shielding of the dealer from ulterior attacks and motives of those speculating in cars.

HAUL OIL BY TRACTORS

Cuevitas, Tex., May 17—Hauling crude petroleum by tractor and trailers from the producing wells in the western part of Zapata county, near here, to the railroad shipping point at Hebronville is now being done regularly. The distance is approximately forty miles each way. The tractor hauls on each trip three large tanks, each containing 160 barrels of oil. The oil is obtained from a group of thirty shallow wells, averaging 160 to 200 ft. in depth, and each having an output of 5 to 10 barrels a day. The product is very high grade. Many other shallow wells are to be drilled in that same locality. Four deep test wells are being drilled in that section. All of these wells are within fifteen to twenty miles of the Rio Grande.

WANT STANDARD WHEEL HUBS

Buffalo, May 18—Fifteen manufacturers of metal wheels attended a meeting here recently to discuss further standardization of truck wheel hubs. Virtually all of them were agreed that the truck hub situation is no better and probably worse than that relating to passenger cars. It was reported that the Society of Automotive Engineers would consider the question at a meeting May 13 and the manufacturers decided to call another session for June 6 to which they will invite makers of axles, wood wheels and bearings. The sole purpose will be to accelerate standardization of hubs.

Weather Bulletins Aid Truck Men On Road Conditions In Massachusetts

BOSTON, May 18—Commissioner John N. Cole of the State Department of Public Works, which includes the Highway Commission, is making plans to issue a road bulletin service for the benefit of motorists and truckmen. It is his intention to have information gathered each week as to the condition of the principal motoring routes throughout the state, with data concerning detours, road construction and the like and to issue it regularly in bulletin form, so that motorists, in planning trips, can know what they may expect in any section of the state in road conditions.

Last fall the United States Weather Bureau inaugurated a highway weather service, which covered the condition of roads in New England, with particular reference to the weather. This proved of great value to truck owners and also the drivers of passenger cars. But as

Seattle Dealers Open Educational Campaign to Benefit Car Owners

SEATTLE, May 18—An educational campaign to acquaint Seattle motorists with the "how" of obtaining the best service out of their automobiles is being waged by the Seattle Motor Car Dealers' Association. The campaign, purely a co-operative one, is attracting wide attention. It is being waged by the car dealers in the belief that if the motorists are schooled to give their automobiles the same care and attention they do to other items of their property the results will redound favorably to the American automotive industry as a whole.

Typical of the educational methods followed is the following communication sent by the Seattle association to car owners and prospective car owners:

"Your furnace representing an investment of perhaps \$500 gets its regular cleaning and adjustment.

"The vacuum cleaner, sewing machine and washing machine all come in for periodical attention by the family head.

"But how about your motor car? How about this investment of more than \$1000 which is standing in your garage and forgotten until you need it?

"Many motorists never look at the grease cups of their automobiles. Others do not realize that a clean engine will last longer and function better than a dirty one. A systematic tightening of the screws and bolts will save much wear and tear on a car.

"A motor car cannot complain because of ill treatment. It will run until the neglect has caused a deterioration of some vital part. And then it collapses—perhaps to be condemned by the very person who is directly responsible for the collapse.

"A locomotive speeds along at from

twenty to forty miles per hour over smooth rails on ballasted trucks and on favorable grades. Its right of way seldom calls for emergency stops or starts, or sharp, quick wrenching turns. Yet at 2000 mile intervals the engine is put into a roundhouse for overhauling.

"The average motor car is called upon to go from twenty to forty miles an hour—sometimes faster—over roads where the going is often rough. The car sometimes is tugging through mud, sometimes weaving over rocky roads, making sharp turns, stopping and starting—most of the time straining itself to the utmost tensile strength of the finest steel. High speeds are maintained for long periods of time causing a great heat.

"All these things tend to tear down the mechanism and shorten the life of the car or some of its component parts. Sometimes 20,000 miles are covered before the owner will concede his car the mechanical attention it deserves. And then—some actually complain at a fair cost for repairs.

"Given proper care an automobile will deliver transportation at a reasonable cost—unreasonable use will make operating costs commensurate with the abuse.

"Remember after all an automobile is only a piece of machinery, and machinery must have proper care if it is to function properly and give maximum results."

ELECT BOSTON TRUCK OFFICERS

Boston, May 18—The annual meeting of the Boston Commercial Motor Vehicle association, the local organization of dealers in trucks, was held here last week. J. S. Hathaway, manager of the Boston branch of the White company, was re-elected president. The other officers, all re-elected, are J. W. Maguire of the Pierce-Arrow, vice-president; Day Baker of the Oneida, treasurer; Chester I. Campbell, secretary; P. S. Aultman of the Kelly-Springfield, N. H. Halliday of the Mack; L. B. Sanders of Dunbar, Sanders, Inc.; W. H. Baker of the Selden, C. P. Rockwell of the Nash, and J. H. MacAlman of the Stearns, directors.

The only change was the election of W. H. Baker as director to succeed F. E. Wing, who resigned, as he is not engaged in the truck business at present, devoting all his attention to the Marmon car. The question of next year's show was discussed informally and it was the general opinion that the truck should be held in connection with the passenger car show as was the case this year, rather than as a separate exhibition.

ASK UNIFORM THEFT LAW

New York, May 18—A uniform law to cover thefts of motor vehicles has been drafted by the motor vehicle conference committee and will be made public in the near future. As soon as

1000 men, and will bring to Louisville 400 skilled workmen. It proposes to turn out 3000 cars during its first year of operation.

The company, Mr. Young said yesterday, will build its cars, passenger and truck, on the interchangeable parts system. They will range in power from 25 to 40-horsepower, and will be put on the market at from \$1200 to \$1400 each. It is proposed to dispose of \$1,000,000 of stock to Kentucky people.

J. W. HYATT DIES SUDDENLY

New York, May 14—John Wesley Hyatt, inventor of the Hyatt roller bearing, died suddenly May 10 of heart disease at his home, Windemere Terrace, Short Hills, N. J. He was 83 years old. He was born at Starkey, N. Y., and received only a common school education, followed by a year at Eddytown Seminary. He went to Illinois as a youth and devoted all his time to invention.

Next to the roller bearing device, his most widely known invention was the material called celluloid. His brother, the late I. Smith Hyatt, shared in the discovery of the process for its manufacture. Mr. Hyatt's other patents covered a wide range and showed the extraordinary range of his talent. He retired from active business years ago.

FURTHER CAR SHORTAGE IN EAST

Washington, May 18—The already serious car shortage in the east is being still further aggravated by the sending of every available car to the west for the movement of perishable foodstuffs. Chairman Kendall of the Car Service committee of the American Railway association said today this action was being taken in accordance with the transportation act and rulings of the Interstate Commerce Commission.

Part of these cars are being rushed into the wheat belt to bring east the surplus of wheat which has piled up in elevators because of the lack of transportation facilities, thus placing a strain on bank credits.

Mr. Kendall declared that the cars belonging to western roads which are now on the tracks of eastern lines are far in excess of the requirements for these purposes.

New Border to Gulf Good Highway Body Formed in South

HAMMAND, La., May 18—The Louisiana Division of the Mississippi Valley Highway association has been organized here to aid in the construction of a hard surfaced highway, running from Duluth, Minn., to New Orleans, entering this state between Poplarville, Miss., and Bogalusa, La., and passing through the last-named city, Covington, Hammond, Pontchatoula and Kenner, thence into New Orleans.

Officials of the Louisiana division are H. O. Loranger, president; Xavier A. Kramer, of Magnolia, Miss., vice-president; Karl Treen of Covington, La., secretary; H. G. McCall, New Orleans, treasurer, and the following directors: Carl Webster, Bogalusa; M. C. Huckaby, Covington; O. P. Woldrop, Hammond; R. E. Rester, Poplarville, and H. G. McCall, New Orleans. A mass meeting was held in New Orleans recently, on the occasion of the visit of H. C. White, general manager of the Mississippi Valley association. Louisiana is the last division to be organized. Of the 1500 miles total length of the road, 600 miles has been completed and 750 more provided for by bond issues. Minnesota, Iowa and Louisiana are the only states through which the highway passes which

have not provided funds for its construction, and these states will issue bonds for it this fall, according to Mr. White.

The Mississippi Valley highway is a hard-surfaced road, being constructed from uniform plans all the way, and will be completed in two years, enabling travelers to motor from St. Paul, Duluth or Chicago, direct to New Orleans. Local clubs for the advancement of the project have been organized in Bogalusa, Hammond, Covington and New Orleans, as parts of the Louisiana division. W. H. Nalty of Hammond, and J. K. Johnson, of Bogalusa, are the Louisiana state representatives. J. M. Fournoy of Hammond is supervising engineer for the state, and G. C. Merkey of the New Orleans Association of Commerce has been made assistant to General Manager White.

LINCOLN, ILL. TO HOLD SHOW

Lincoln, Ill., May 17—Dealers in motor vehicles of Lincoln, Ill. voted to stage a show of motor vehicles around the courthouse square on Saturday, May 29. It was believed that this date would fit in between the period of corn planting and cultivating.

BUFFALO PROFITS BY "POUND"

Buffalo, May 18—Buffalo's municipal automobile pound is proving profitable as well as corrective. Not only has the pound now daily receipts of \$30 to \$50, sometimes even more, but it has relieved the congestion which formerly existed in the city court through enforced handling of many petty charges against motorists.

When machines are found improperly parked, or when they remain too long in restricted zones where an hour's parking is the maximum, they are immediately towed to the city pound, located but a few blocks from the business district.

When Buffalo owners return to find their machines missing they are fairly positive that their cars have been towed to the garage and they go there immediately.

At the pound the car owner is given his choice of paying \$1 or of facing court prosecution on a charge of violating the traffic ordinance. Not one in a hundred elects to have a trial.

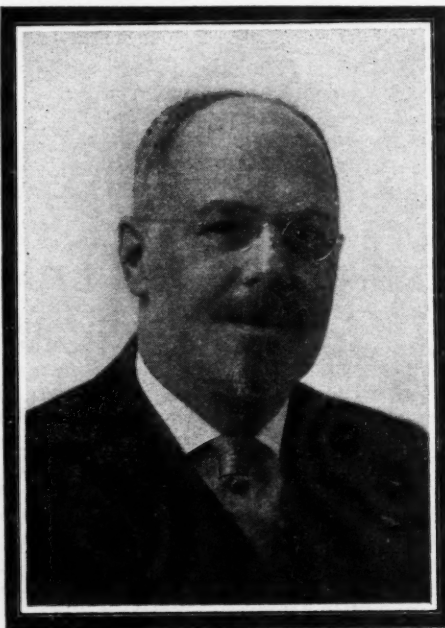
C. H. Gurnett, Advertising Veteran, Passes Away

CHICAGO, May 11—C. H. Gurnett, western advertising representative for the Class Journal Co., died here early today at the Englewood Union Hospital from complications resulting from an operation for acute appendicitis undergone about a fortnight ago. Mr. Gurnett was one of the most widely known advertising men in the automotive industry, having been associated with such work almost his entire lifetime.

Mr. Gurnett was born in Ingersoll, Ont., on July 24, 1866, making him 54 years old at the time of his death. He came to Chicago when he was only 16 years old and actually went from door to door in the business district until he obtained his first position with the A. F. Barnes Co., book publishers. He remained with the Barnes company until its merger with the American Book Co., and continued with the latter concern until 1901.

In 1901 Mr. Gurnett purchased an interest in the Automobile Review and continued as part owner and publisher of that publication until 1903 when he became associated with The Automobile, the first of the automotive publications owned by The Class Journal Co. When Motor Age and Motor World were purchased by the Class Journal Co., Mr. Gurnett was appointed western advertising manager for the entire group of publications, a position he retained until his death.

Mr. Gurnett in 1890 married Miss Ada



Lee, two children, Gwendolyn and Marjorie, surviving from this marriage. In 1906 he married Miss Ruby Ratcliffe of Waukon, Iowa, who survives him, and has had four children by this marriage, Ruth, 12; Alice, 9; Robert, 6, and Charles H., Jr., 8.

Funeral was Thursday from the late residence, 7215 Princeton avenue.

It has been subjected to comment and criticism by those best qualified to deal with the subject a bill will be prepared for introduction in all state legislatures which hold sessions next year. It will contain all the best features of the most successful state laws now on the statute books.

Few of the states have enacted laws which cover all the aspects of the problem. There has been little uniformity in this legislation and there is little similarity in the machinery set up for prevention, detection, arrest, trial, conviction and punishment of motor vehicle thefts. As a consequence co-operation between states is impracticable.

The proposed uniform law has been drafted by a sub-committee composed of J. Howard Reber, counsel for the Auto-car Co., as chairman; W. Eugene Turton, chairman of the legislative committee of the American Automobile Association; C. A. Vane, counsel of the National Automobile Dealers' Association, and S. S. Meyers, counsel of the Motor Accessory Manufacturers Association.

PLAN MOTOR TRUCK TOUR

Syracuse, N. Y., May 18—A demonstration tour through Onondaga and six adjoining counties of central New York will be staged by motor truck dealers of Syracuse the week of May 17-22. Truck shipping for short hauls and motorization of the farms to offset the labor shortage in the rural communities will be the principal theme to be brought out through the tour.

BOSTON HAS BIG GARAGE

Boston, May 17—There has just been opened in the down-town business district a garage that will have accommodations for 600 cars. It is one of the most modern and up-to-date establishments of its kind. Although it has six floors and is without elevators it will take less than a minute to park a car even on the top floor.

The Elliott street garage is located between Park square and Tremont street and is equipped with two ramps or runways with very slight incline, reaching from the basement to the roof. Over the slight grade operators may drive their machines from the cellar to the top floor and down again, thus doing away with walls for elevators. Indeed, the grade is so slight that the average car can take it easily.

A three-room suite for women, spacious rooms for men, and a large room on the third floor for chauffeurs, are other features of the garage.

STOP CURBSTONE REPAIRS

Moline, Ill., May 17—Repair shops of Moline, Ill. must not use the streets for storing cars under repair. Mayor C. P. Skinner brought up the subject in council meeting. He asserted that some shops blockade the streets with cars which are being overhauled. The council voted to amend the ordinance in relation to traffic which will prohibit the use of the streets as a repair shop.

Macon Dealers Find Late Spring Show a Decided Success

MACON, Ga., May 17—Macon's automobile show "went over big." It was staged on a higher plane than ever attempted in the Southeast. Fifty cents admission with war tax added, and the success of the show under these conditions naturally causes W. T. Waters, chairman of the show committee, and other members of that body to feel proud. It means that the days of free automotive shows in the Southeast are over. An even bigger show is being planned for 1921, when it is hoped by the local dealers that the many obstacles encountered here, the railroad tie-ups, strikes in factories making essential parts for cars and an out-of-season rainy spell, will not have to be met.

All of these obstacles, however, were met and overcome in the Macon show. There wasn't a vacant space. More than 150 passenger cars, motor trucks and tractors were exhibited, and the accessories—the equipment end of the show—was the biggest thing of its kind ever assembled here.

Starting out Thursday the automotive show drew a good-sized crowd notwithstanding the rain. But this was "society night," in which women in evening gowns, some in Japanese kimonos (sponsors for the dealers) and men in cosmopolitan dress from evening dress down to business suits, took part. Artists here for the music festival and representatives of the various manufacturers were honored guests for the evening.

The decorations were the most elaborate ever put up in this section of the country, costing more than \$1,500. The exposition building was turned into a Japanese garden. A freight elevator at the rear of the long building furnished the only available space for the band, and some one discovered a plan to keep the elevator in operation while the band was playing. The effect of the music, starting at close range and fading away as the elevator reached another floor, was wonderful. Three floors of the H. J. Lamar Co. building and the Grant-Waters building, fire-proof structures, were used for the show. Thousands of persons filed through the exhibit halls while the show was on, giving close attention to the late models that were on display and asking many questions. Numerous sales were reported by dealers.

A side feature of the show was the convention of Oldsmobile dealers of Georgia, distributors being in attendance from every state in the Southeast. Factory representatives also here, included R. L. German, comptroller; Charles A. Tucker, general sales manager, and E. J. McMullen, of the technical department of the Olds Motor Works, of Lansing, Mich. These dealers held a luncheon at the Hotel Dempsey in the afternoon and

turned out en masse at the society night feature.

Governor Hugh M. Dorsey was the honor guest on Thursday night, at the opening of the show, coming down from Atlanta especially to wish the automobile dealers success in their venture. He declared that it was a complete show; that the decorations were the most elaborate he had ever seen in a show of that kind.

MONROE, LA. HAS EXHIBIT

Monroe, La., May 18—The Monroe automobile show, the first which this city has held, opened May 14, and extended through May 15 and 16, with a parade participated in by virtually every passenger car and truck in town on the morning of the 14th. The show will be held in the large pavilion in Forsythe Park, under the direction of the Monroe Automobile Dealers' Association, and will exhibit passenger cars, trucks, tractors and home lighting and power plants.

The show was opened by the mayor, and there were addresses by A. King, president of the Monroe dealers, and C. U. McDowell, general manager of the Louisiana-Mississippi Automobile Trades Association. About forty types of passenger cars were shown, with ten or twelve trucks and tractors. A number of dealers from New Orleans, Lake Charles, Shreveport and other Louisiana cities have reserved accommodations at the local hotels for the period of the show.

PIERCE CUTS PRODUCTION

Buffalo, May 18—Shortage of coal and raw material on Monday of this week forced the Pierce-Arrow Motor Car Co. to make reductions of the working forces of all departments.

Officials of the company said that if shortages were not overcome it would be necessary to place a large percentage of the employees on a three day a week basis, in order to give all some work.

The tieup of transportation resulting from a second unauthorized strike of Buffalo switchmen and yardmasters was the cause of the enforced reduction of production at the Pierce plant. Company officials said they hoped the reduced output would be only temporarily.

COLUMBUS, NEB., HAS SHOW

Columbus, Neb., May 18—The first annual motor show was held here last week with trucks, tractors and motor cars on display. A style show was held in connection.

NEW CAR FOR LOUISVILLE

Louisville, May 17—Louisville is to be the home of the Preferred Motor Car Co., capitalized at \$2,000,000, which proposes, in three years after establishing a factory here, to turn out 10,000 cars a year. Representatives of the concern, with temporary offices at Indianapolis, have been here for some time looking for a suitable factory site and conferring with officials of the Louisville Industrial Foundation.

The concern, according to its president, F. W. Young, will employ about

Big Interest In Indianapolis Race Is Manifested This Year By Industry

INDIANAPOLIS, May 17—Two weeks before the annual race indicates that this year's 500-mile Derby over the Indianapolis Speedway will be the greatest affair ever staged at the Hoosier oval. From every standpoint all previous accomplishments seem sure to be eclipsed and with any sort of weather, the 1920 race is certain to live long in the memory of those who see it.

From attendance, class of entries and probable speed, past achievements of Indianapolis seem certain to be eclipsed. Never has the interest in the affair been more widespread and with America at the peak of the greatest revival in her history of interest in sporting events of all kinds, there is little doubt that motor racing, particularly that brand which is represented by Indianapolis, is in for a great year.

From all parts of the United States inquiries and requests for seat reservations have swamped the Speedway headquarters. News of special trains being run from distant parts of the country is almost a daily occurrence, and if the railroads will furnish the equipment for the race crowds that they have promised, Indianapolis' terminal facilities are going to be taxed to their utmost to take care of the special train coaches.

Texas and Oklahoma oil field men have already notified the Indianapolis Speedway of one special train which is to be run from there and the prospects are that there will be at least one more before race day arrives. Another train is to be run from the south, taking on automobile dealers and enthusiasts from that section. The east is to furnish another train, while there probably will be a dozen or more from Chicago, Detroit, Cleveland and other cities within a night's ride of the Hoosier metropolis.

Only in number of entries will this year's race be behind others. While no official list of nominations has yet been given out, it is understood the number will not exceed twenty-five starters, with the probabilities favoring two or three less than this number. Thirty-three cars are allowed by A.A.A. rules to start on the track.

What the entry lacks in number, however, it makes up in quality. For the first time in racing history, the cars are limited to 183 cu. in. piston displacement, a little more than half the displacement of previous racers. This means that every car in the race will be a brand new job, as contrasted with the old cars of last year when the limit number started.

The new car angle makes it a moot question whether there will be a new record for the track. Probably there never has been so much controversy as this year as to this phase of the race. The new cars have yet to be tried—no one knows just how fast they can go. The only entrant in the race which has

ever had experience with 183 cu. in. cars is the Peugeot, and Peugeot's experience has been so limited as to offer little criterion.

The international rivalry also is strong this year. The race is virtually a match between France and the United States. Peugeot and Ballot will carry France's Tricolor, while the Stars and Stripes will be borne by the Duesenberg and by the Frontenac and Monroe teams—both of which are products of Louis Chevrolet's engineering skill and which are identical in all respects.

ROCHESTER RACE MAY 31

Rochester, May 18—The automobile racing season in this section will open on May 31 with a series of events on the Brockport mile dirt track under the direction of the Liberty Speedway association. Sanction for the races has been granted by Secretary Kennerdall, of the American Automobile association, to Frank G. Bell, as president of the Liberty Speedway association. Albert Means, secretary of the Racing board of the A.A.A., will be the official representative at the track.

The A.A.A. has indorsed racing dates for the Liberty association in fifteen cities and towns, including Montreal, Toronto and places in New York, Ohio and New York City.

There is being built in this city a specially designed racer under the design of Mr. Bell, which will be eligible to race on any speedway in the country.

Dallas Plans for Big Carnival of Motor Racing First Week in June

DALLAS, Texas, May 18—Probably the greatest automobile racing event to be held in the Southwest this season will be staged on the tracks of State Fair of Texas at Dallas on June 4, 5 and 6. For that event there will be entries ranging from the fastest cars on the dirt track to the treacherous little polo cars.

For the racing events the program has been divided into three sections. One will be limited to entries of drivers and cars from Texas. Another is open to drivers and cars from Oklahoma, Texas, Arizona and New Mexico, and the third is limited to professionals from the dirt tracks of the earth. The professional races will be run on Sunday, June 6. Entries to these races will be limited to professionals who are members of the International Motor Contest association.

W. H. Statton, secretary of the Fair association, declares some of the kings of speed courses with their newest machines will be seen in the grand sweepstakes which will close the event. It is expected that some dirt track records will be shattered. The track is in the

The car will have a 98-in. wheelbase, with 24-in. extension over the front axle. The crankcase is a new device on which Mr. Bell has applied for patent rights. It has three copper tubes extending the length of the case through which air is forced while the machine is in motion, thus cooling the coils and increasing the lubrication properties at least 20 per cent, according to Mr. Bell. Another feature is that the springs are not set parallel with the chassis, but at a 20 deg. angle.

SIXTEEN ENTRIES FOR SEATTLE

Spokane, Wash., May 17—Sixteen entries for the July 4 and 5 automobile races at the Interstate fairgrounds have been received. The races will be held under rules of the American Automobile Association.

Prominent among the early entries are Charles Lotta of Seattle, who will drive the "Romano" special, which won notoriety in Spokane four years ago, and E. Schneider of Yakima, who will drive a Stutz car.

The entries already made follow: Walter Blume, "Lott Special," Seattle; Gus Duray, "Stutz Special," Seattle; Jack Ross, "Stutz Special," Seattle; Charles Lotta, "Romano Special," Seattle; Henri North, "Chandler Special," Seattle; Bill Giddings, "Giddings Special," Seattle; Will McDonnell, "Ford Special," Seattle; Hugh Swartz, "Mercers Special," Seattle; Jim Butters, "Comet Special," Seattle; P. J. Erdman, "Erdman Special," Seattle; E. Schneider, "Yakima Special," Yakima; Carl Erickson, "Vancouver Special," Vancouver, B. C.; Jim Healy, "Stutz Special," Vancouver, B. C.; Ira Hayes, "Hayes Special," Kent, and Lloyd Bugler, "Bugler's Special," Vancouver, Wash.

pink of condition and some of the greatest speed demons have already entered for the contest.

Mr. Statton said application for the three days' racing program had been applied for and since there are so many events that it is impossible to crowd them on a program of two days he anticipates no trouble in having the board governing such events making a special event to cover the three days' racing on the same track.

In addition to the automobile racing there will be some dare-devil aerobatic stunts, it is announced.

MANY LOUISIANA ROADS COMPLETED

New Orleans, La., May 18—Stanley M. Lemarie, secretary of the Louisiana Motor League, has returned to New Orleans after six weeks spent in touring 2200 miles of road through forty-four of the sixty-three parishes of the state, collecting data for presentation to the present session of the legislature in the campaign for a \$35,000,000 state bond

issue for good roads. He broke twelve spades, seven picks, a number of shovels, and raised a crop of callouses on his hands that would make an alligator envious. The only thing he brought back in virtually the same condition in which he went out was the Ford in which he rode.

At the behest of Governor Pleasant, the police juries (corresponding to boards of supervisors) in all the parishes visited, gave Mr. Lemarie every aid in compiling this data, which will eventually be given to the motoring public in pamphlet form. Statistics obtained cover every mile of the 2200 covered, which were specially selected to include the parishes having the worst roads in the state. In one parish, eleven hours were required to cover 82 miles on the best road in the parish.

CONTROVERSY TIES UP LINCOLN HIGHWAY

Wilmington, Del., May 14—Because of hostility of some of the land owners to a straightening of the line, a section of the Lincoln Highway between Wilmington and Newark, Del., is being held up. In the meantime, however, the present road, which is in fair condition, is being used.

SPENDS \$500,000 ON ROADS

Houma, La., May 18—Caliborne Parish, of which this is the seat, has sold its 500,000 dollar bond issue to the Whitney-Central, Interstate and Canal banks of New Orleans. The proceeds will be devoted to building gravel roads, with necessary culverts and bridges throughout the parish. James W. Billingsley, consulting engineer, of New Orleans, has been retained to supervise construction.

Texas "Ship-By-Truck" Demonstrations Impress Farmers With Vehicles' Utility

DALLAS, Texas, May 16—If the farmers and business men of Texas have not already realized the necessity of good roads and the value of the use of motor trucks they will be aware of both before the motor truck dealers in various distributing centers of the state discontinue their plans for covering all parts of Texas with "ship-by-truck and good road tours." Texas will have a ship-by-truck week during the present month, but dealers in various cities have not waited for that to come to tour their trade with a long string of motor trucks.

The Dallas dealers have just completed their ship-by-truck and good roads tours. It extended over more than a dozen counties and consumed an entire week. From the manner in which business men and farmers received the evangels of the motor truck the people are alive to the necessity of motorizing business and the farms and at the same time conduct permanent roads.

One feature of the Dallas tour, and one which will be extended to tours of dealers in other Texas cities was the

Louisiana Plans to Ask for a \$35,000,000 State Good Roads Bond

BATON ROUGE, La., May 18—One of the first, most important, and most heavily supported measures to be presented to the Louisiana legislature, which convened May 10, will be a bill creating a state bond issue of \$35,000,000 for an all-year-round, all-state highway system. Ruffin G. Pleasant, governor of Louisiana, is in favor of the measure, as is also John M. Parker, governor-elect, who will wield a powerful influence with this legislature. The bill was drawn by P. M. Milner, president of the Motor League of Louisiana, and is being actively supported by the Good Roads Bureau of the Association of Commerce of New Orleans, with all the other associations and chambers of commerce in the state; the Louisiana-Mississippi Automobile Trades Association; the New Orleans Automobile Dealers' Association, and the Motor League.

Under the bill, five to nine years will be required to carry out the road-building program, and the outlay will be \$35,000,000 net, not the proceeds of a bond issue of this size after banks have been allowed to "scalp" the principal. In brief, the measure calls for a state bond issue, with a tax of one and one-half mills to care for interest and indebtedness in 40 years. The state highway department is to be rebuilt into a separate division of the state government, with one expert in charge and responsible to state government and people for the carrying out of the program. This highway chief would be assisted by an experienced supervising engineer and a

superintendent of maintenance, a superintendent of construction and a superintendent of equipment, all, in turn, responsible to the head of the department alone.

Four trunk highways leading into New Orleans, and tapping the four cardinal sections of Louisiana, would form the backbone of the new system, giving access to New Orleans over the Southern National (two sections); the Jefferson Highway; the Jackson Highway, and the New Orleans-Hammond road. These would open New Orleans—now virtually isolated so far as highways are concerned—to Shreveport and the northern state line; to Texas and the western state line, and to the eastern state line and the Gulf of Mexico Coast clear around to Florida. In addition to these four trunk highways, every parish would be connected with every other parish—63 in all—by cross roads, in turn connecting with the main lines. An elaborate scheme of all these roads has been worked out in the bill, giving the state a total of 2,155 miles of improved highways, as follows:

Dixie Overland, 185 miles; Jefferson, 410; Mississippi, 90; Ozark cutoff, 180; Pelican Highway, 225; Southern National, 320; Pershing, 200; Nachitoches, Alexandria and Louisville, 150; Baton Rouge and Shreveport, 105; Beauregard, 85; New Orleans-Pointe-a-la-Hache, 45; Shreveport-Arkansas, 40.

Louisiana is very backward in highway development, the roads are in a deplorable condition, and it is virtually impossible to get into or out of the southern part of the state by car during the rainy season. The Association of Commerce of New Orleans estimates, and so says in its endorsement of the above bill, that the completion of one all-the-year-round highway into New Orleans will bring more than \$1,000,000 in business to the Crescent City every year.

CORNING, N. Y., FORMS CLUB

Buffalo, May 18—Corning, N. Y., now has an automobile club, which hopes to reach a membership of 500 in the near future. Officers of the club, elected at an organization meeting last week, are: Robert W. Terbell, president; Dayton Mahaffey and Harrie O. Anderson, vice presidents; Wallace A. Brennan, secretary and treasurer.

LIMIT NEW YORK TRUCK SIZE

Albany, May 18—Governor Smith has signed a bill limiting the size of motor trucks in use on country highways to 8 feet in width and 12½ feet in height with a combined weight of truck and load not to exceed 25,000 pounds. Truck manufacturers say comparatively few users of heavy trucks will be affected by the law as there are only a limited number in use in this state which will come within the prescribed weight limit.

absence of advertising matter. The dealers carried a band with them and "shelled the woods" with music, but there was no advertising matter tacked to their string of eighteen different makes of trucks, nor were the speeches made during the trip of an advertising nature. Trucks were not sold on the tour, but the necessity for trucks on the farm for cutting the cost of marketing, and the construction of better roads were emphasized at every point.

Fort Worth dealers are to have a truck train sent through the oil and grain belts beginning May 17 and continuing for a week. It will be along the lines of the Dallas tour. Houston dealers have planned a tour covering some twenty counties to take place during May. San Antonio dealers will tour their territory, and there is a probability of Waco, Beaumont and El Paso putting on truck tours.

To cap these tours and further impress the importance of motor trucks for farmers and business men, there are plans now for a state meeting of the truck dealers following the tours.

Car Service Commission Takes Up Shortage Problem

Relocation of Box Cars is One of
Things Which Will Be Threshed
Out at Meeting

WASHINGTON, May 18—Protests of automotive manufacturers to the American Railway association, Commission on Car Service, and the Interstate Commerce Commission, on the failure of the individual lines to provide an adequate car supply and against any undue diversion rules have been under consideration this week. The Car Service commission to-day denied charges of discrimination made by some automobile shippers.

Relocation of box cars for the purpose of equalizing ownership, it is said, was responsible for the report that the government was seizing cars destined for automobile factories and concentrating in the wheat states. They point out that the requirements of the Middle West and the Far West are particularly heavy at this time of the year. Officials in the Washington offices claim that the complaints from automotive centers have materially decreased. With the factories moving their products under their own power in lieu of freight cars, the situation has been greatly relieved. The demand continues heavy and far in excess of the supply. Automobile cars were delayed in movement to factory last month by labor disturbances. It is only through special orders issued by the Car Service commission that these badly needed cars are reaching their home lines.

It is the contention of traffic officials here that many shippers in the automotive industry are not fully advised as to the actual intent of the relocation of cars. Statistics as of April 15 on the percentages of freight cars on line to ownership show that eastern roads have more than their share of equipment. It is in compliance with the Transportation Act and rulings of the Interstate Commerce Commission that the railroads have been reducing these accumulations.

LAFAYETTE NEARS PRODUCTION

Indianapolis, May 17—The Lafayette Motors Co. are assembling cars and will be able to deliver to their distributors a demonstrating car during June, it was said at the factory today. The distribution of the demonstrators will be made simultaneously.

N. A. C. C. DIRECTORS TO MEET

Detroit, May 18—Directors of the National Automobile Dealers' association will hold a meeting in Detroit May 31 and June 1 and 2. The National directors will be guests of the Detroit Automobile Dealers' association, and General Manager H. H. Shuart is preparing an entertainment program for the visitors.

What action is to be taken at the meeting or what matters will be taken up for discussion has not been announced, but

it is presumed the decision of the motor truck committee of the National Automobile Chamber of Commerce, to recommend holding truck shows at different seasons from passenger car exhibitions is to be thoroughly thrashed out. It is the opinion of many dealers and many members of the Chamber of Commerce that the passenger car shows have so overshadowed the truck exhibits as to make the latter hardly worth while. Certainly it is contended that they cannot prove successful when held in conjunction with passenger car exhibits.

ATLANTA TO GET TUBE PLANT

Atlanta, Ga., May 17—An inner tube plant having a capacity of about 2000 tubes a day will be built in Atlanta this summer by the Victory Rubber Mfg. Co. of Atlanta. The company is now operating in a temporary factory,

DRAMATIS PERSONAE

An Elderly Gentleman.

Lizzie, seagoing limousine.

Chauffeur.

Crowd of Supers, etc.

Locale—Nahant, Mass.

Parking his machine on the Nahant Beach while the tide is out, Charles W. Foss of 301 Robertson road, Jamaica Plain, is wooed into sound slumber by the dulcet lapping of the wild, wild waves. Christopher Buick, (not the make of the car), chauffeur, takes walk. *(Curtain lowered to indicate lapse of time.)*

Elderly gentleman still sleeping. Lizzie under water up to hubs. Wild waves still lapping. Enter crowd of supers. Wild cries of terror from supes, but no help. Sound of running off stage. Chauffeur enters panting. Bares tootsies. Rescues elderly gentleman from submerged Lizzie. Cheers from supes. All hands at ropes. Lizzie high and dry and as full of pep as ever.

Home, Christopher!
(Curtain.)

but expects to begin production in the new plant next fall.

Land has been purchased on the Central of Georgia right of way near Fort McPherson and construction will begin during May. The plant will cost \$100,000 and, according to announcement by officers of the company, is the first unit in a \$1,000,000 tube manufacturing plant. Detailed plans are being worked out by architects and engineers.

NEW TRUCK IN SOUTHERN TOWN

Greenville, Miss., May 18—The Menges Motor Co., with an authorized capitalization of \$1,000,000, has been organized here, with B. B. Payne, president and J. E. Foster, secretary. The new company plans the manufacture, at a plant now being erected in Greenville, of the Menges Truck, of which A. C. Menges is the designing engineer.

Denies Federal Reserve Will Issue Secret Order

Action Affecting Automobile Paper
Is Not Contemplated, Says Gov-
ernor Harding of Board

WASHINGTON, May 15—Governor Harding of the Federal Reserve Board in an interview to MOTOR AGE to-day denied the report that the Federal Reserve Board would issue confidential instructions to member banks to restrict the volume of credit to the automotive industry when their representatives assemble here for the regular quarterly conference Monday and Tuesday. The executives' attention had been called to current and persistent reports to the effect that the board would quietly pass the word throughout the country that it would be more advisable to tighten up on loans for the purchase of pleasure cars in order to permit the money to be used in agriculture and other essential and productive enterprises.

The Federal Reserve Board would not undertake to issue such orders on the basis of passenger cars being a non-essential, Governor Harding said, because the act under which it operates does not provide this power with the cessation of hostilities and the period of war emergency. There is nothing in the Act, however, the official declared, which requires the Federal Reserve Bank to discount any paper.

The governor makes no claim that the subject of automobile loans will not be thoroughly discussed at the conference here Monday. He points out that all vital subjects are up for consideration in the group meetings. It may result in the adoption of a new policy, but the opinion prevails that the present plan of leaving matter of class loans to the discretion of a Federal Reserve Bank will continue, until the transition stage is successfully passed.

It was the personal opinion of the governor that the demand for loans would be appreciably diminished as the shortage of gasoline supplies became more evident. There are many financiers, through the country who seem to take this same view—that demand for passenger cars will diminish as fuel prices advance.

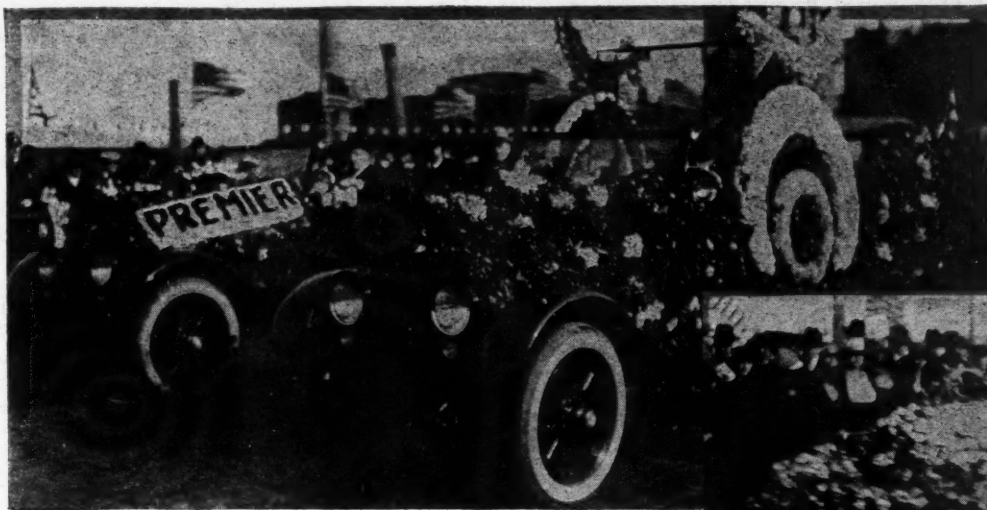
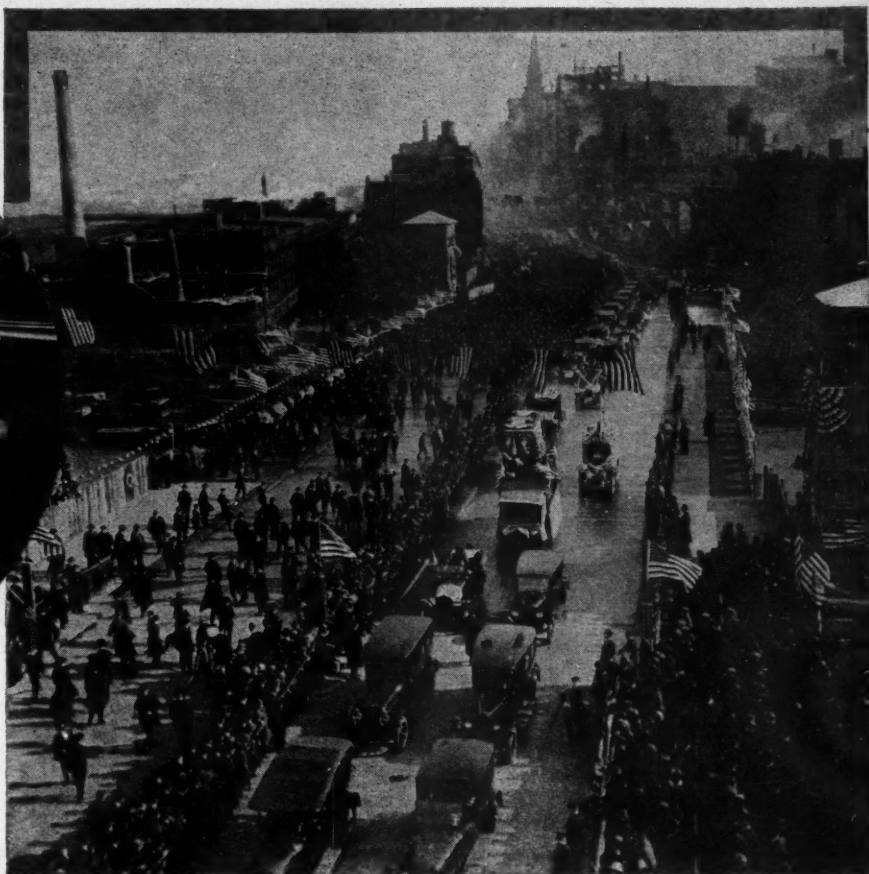
ED. SPOONER QUILTS FREE PRESS

Detroit, May 17—F. Ed. Spooner, for 11 years editor of Automotive World column on the Detroit Free Press, has resigned to devote his attention to other interests. Mr. Spooner is widely known in the automotive industry having graduated from the old bicycle squad and having been among those present at every automobile racing event and national show since the industry had its birth. Pressure of other business including his publicity bureau in Detroit and his connection with Motor West, published on the Pacific Coast, compelled him to relinquish his post with the Free Press.

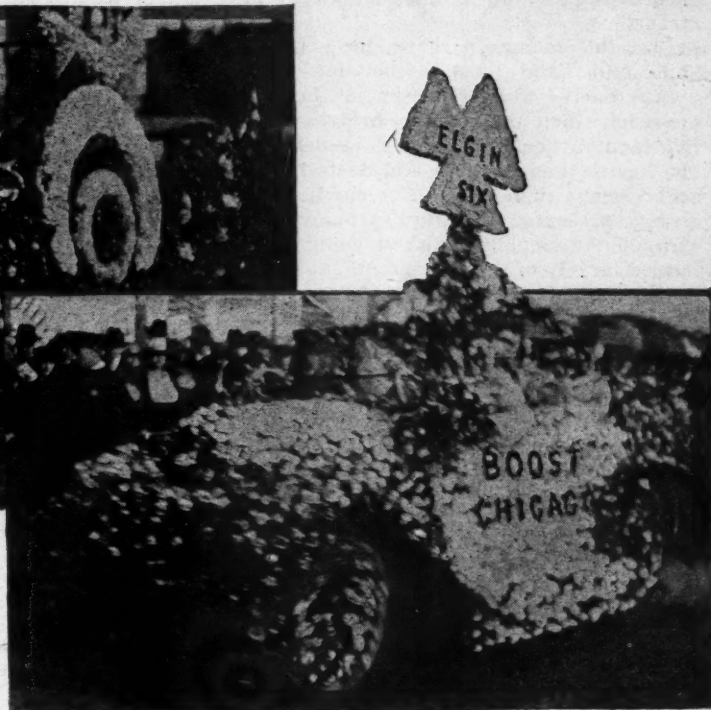
Chicago Formally Opens the Link Bridge



Above, Mayor William Hale Thompson cuts ribbon and officially opens the new Boulevard Link Bridge to traffic; right, the automobile parade passing over the bridge. Only half the bridge roadway was utilized in order to give spectators a better chance to see the parade



Some of the decorated cars which featured the parade. The cars shown here were part of the contingent furnished by members of the Chicago Automobile Trade association



CHICAGO, May 14—Motor car dealers, automobile clubs and civic organizations turned out to make this a roaming holiday for Chicago. The cause of the holiday was the formal opening of the Boulevard Link bridge which was formally thrown open to traffic this afternoon at 4 o'clock. An automobile parade,

consisting of several thousand machines, made the occasion one of the most pretentious in Chicago's annals of automobile activities.

The Boulevard Link bridge forms the connection between the north and south side boulevard systems of Chicago, and is virtually the only entrance to Chi-

cago's Motor Row, which is largely located on the south side, from the north shore residence district, the wealthiest in the city. Although the completion of the Boulevard Link is a matter of civic pride, it is particularly a source of rejoicing for the automobile men, for it

(Continued on next page)

Brooklyn Service Men Increase Membership Roll

Association Now Numbers Sixty-five
With 150 the Goal Now
Being Tried For

BROOKLYN, May 14—The regular monthly meeting of the Automotive Service Association of Brooklyn was held here this week at the Long Island Automobile club. This fast-growing association now has a membership of about sixty-five, and the fact that almost fifty of these were present at the meeting is proof of the enthusiasm with which the idea is being received in Brooklyn. A determined drive to bring the membership up to 150 by the next meeting is being made.

H. L. Bailey of the Chevrolet Motor Co. was appointed to represent the association at the coming Indianapolis service convention.

The entertainment consisted of a two-reel motion picture showing the operation of the Northeast Model G starting-lighting system as applied to a Dodge car. The system was shown diagrammatically and the paths of current flow indicated by moving arrows. In this way the function and operation of the different units were clearly explained.

OPEN BOULEVARD LINK BRIDGE

(Continued from preceding page)

means opening up to them an artery of trade.

For this reason, perhaps, the automobile clubs and trade association were particularly well represented in the parade which opened the bridge. The Chicago Automobile Trade association had more than 100 cars and floats in the procession; the Chicago Automobile club was represented by twice as many; the Illinois Automobile club, which is composed largely of dealers and others interested in the automobile industry, had more than 500 machines and floats in line; the Chicago Motor club had another 750. The Avondale Motor club had 300 machines with the Medinah Motor club with another 100 in line.

Clubs and trade associations, however, were not the only organizations which helped the celebration. The Sinclair Oil Co. had a fleet of more than 100 of its trucks in the procession and the Standard Oil Co. had 250 of its machines together with numerous floats and a band. Several of the big Chicago industries, notably the packing firms, had gaily decorated truck fleets in the parade while there were cars almost without number representing ward clubs and other civic organizations.

The parade formed near Motor Row on the south side, and proceeded slowly to the bridge where Mayor Thompson formally opened the link by cutting a red, white and blue streamer stretched across it. The motorcade then moved across the bridge, preceded by the mayor's car, and proceeded about a mile

north on Sheridan road, where it disbanded. There was no speechmaking nor other ceremonies other than the parade.

The Boulevard Link bridge has been described more fully in previous issues of MOTOR AGE. It is said to be the largest and most ornate bridge structure in the world and was erected at a cost of between \$10,000,000 and \$12,000,000. It is part of the City Beautiful plan, and while it was first discussed more than twenty years ago, actual work on its construction, entitling the widening of more than a mile of city streets in the most congested business district, did not start until April 15, 1918, two years and one month, minus one day, of its formal opening. While the bridge is now open for traffic, it is far from completed, as virtually all the ornamental stone and iron work is yet to go into place.

H C S DEMONSTRATORS READY

Indianapolis, Ind., May 17—The ten H C S demonstrator cars manufactured by the H C S Motor Co., the first production of that factory, have been shipped to the distributors, one of which is being used in Indianapolis and which is attracting big attention from local motor car buyers. The H C S car in Indianapolis is being sold by the Charles E. Stutz Sales Co.

Sales Manager Ford of the H C S company said that the H C S cars will be made in production in ten days, as big a production as possible with the limited manufacturing space and transportation conditions. The new factory buildings of the H C S company are not progressing as they should because of labor conditions in the building trades.

PENDOCK TALKS AT S. A. E. MEET

Minneapolis, Minn., May 17—"The Relation of Engine Design from a Standpoint of Production," was the title of a paper, presented to the Minneapolis section of S. A. E. by C. W. Pendock, President and Chief Engineer of the Le-Roi Engine Co., Milwaukee, Wis. This meeting being marked by the election of officers for the forthcoming year; the officers elected were: J. H. Scarett, chairman; J. W. Kinkaid, vice chairman; C. T. Stevens, secretary and C. S. Clapper, treasurer. Dinner also was served.

OAKLAND TO DOUBLE OUTPUT

Pontiac, Mich., May 21—Production doubling that of the last four years is planned by the Oakland Motor Car Co., for the year beginning July 1, when the extensive building additions will have been completed and all departments of the plant are in operation in the immense new factory. Additions to the engine plant, the assembly department and a large four-story warehouse now are in course of construction and rapidly nearing the completed stage. It is planned to have a daily output of 320 cars when all departments of the factory are started in the new plants.

Combined Garage and Office Building for Dallas

Station with Capacity of 1000 Cars
Is Outlined for Downtown
District of City

DALLAS, Tex., May 17—Plans for the building and operation of a combined office building and automobile garage with a capacity of 1000 cars in the downtown district of Dallas are outlined in a letter received by E. Dick Spillers from Harrill Bridges of Fort Worth. The proposition will be placed before a number of Dallas business men. Mr. Bridges says that he possesses royalty rights on a scientifically designed garage building, 175 feet high, with a circular diameter of 160 feet. The building he is planning to erect will have office space, a repair shop on the roof under glass, filling stations of the ground floor, washing racks on every floor, with freight and passenger elevators and inclined runways connecting each floor.

The Dallas Automobile Dealers' Association, of which S. G. Davis is president and J. H. Shelton, secretary, has officially endorsed the "open shop" movement in this city, according to the announcement of T. P. Roberts, manager of the Dallas Open Shop Association.

REVIEWS MOTORCYCLE PATROL

Harrisburg, Pa., May 18—Governor Sproul inspected the thirty-five motors of the new motorcycle squad the state police, members of which arrived in Harrisburg from the state police training school at Newville. The squad soon will be doubled in number. It will patrol the highways with a special object of looking out for the numerous automobile bandits infesting the state.

MOOCK VISITS EASTERN DEALERS

New York, May 18—Harry G. Moock, national secretary of the National Automobile Dealers' association, paid a brief visit to New York recently as the climax of an eastern trip on business for the organization. While here he took up with prominent dealers the affiliation of the New York association with the national organization.

On his way east, Moock addressed the Columbus dealers and those in Washington and Baltimore. On his way back to St. Louis he spoke in Richmond, Va. The Washington association decided to join the N. A. D. A. and a special meeting will be called in Baltimore to take up the question.

While in the capital, Moock looked into the prospects for passage of the Townsend highways bill and the Pittman one license measure. He found the outlook good for both. State organizations of the N. A. D. A. are being formed as rapidly as possible. Field workers now are busy in Indiana, Arizona and the Inter-Mountain states.

As the originator of the first motor truck tour, the N. A. D. A. is lending whole-hearted support to popularizing "ship-by-truck" week, May 17-22.

Columbus Gets Only Tractor Show for Year

**N. I. V. A. Committee Rescinds
Previous Action and Will Hold
One National Exhibit**

CHICAGO, May 17—Only one national tractor show will be held for 1921 and Columbus O., has been selected as the site for the exhibition. No dates have yet been set for the event, but it is probable that it will be held either just before or just after the first of the year. Some dealers have requested an October date, but it is the sense of the show committee that this is too early for the farmers who are expected to contribute largely to the attendance.

In scheduling only one show and labeling that a national event, the show committee of the National Implement and Vehicle association rescinded action taken just before the recent show at Kansas City when it was decided to hold four or more sectional shows. It had been believed that four sectional shows would be held and the action of the committee was the occasion of considerable astonishment with those closely in touch with the situation.

According to Finley P. Mount, chairman of the committee, the action was taken in view of the present economic and industrial situation in the United States. With a shortage of materials existing at present, freight congestion, such as it has never been before, and no certainty that these conditions will be relieved within the next year, it was decided that four sectional shows would entail too great a financial drain upon the manufacturers, especially the small manufacturers, while the great amount of shipping necessary for four shows would be malapropos in view of the freight congestion. A mail vote showed thirty-two out of forty-three manufacturers favoring one show.

With one show determined upon, the only question to be decided was upon the city which would get it. Minneapolis, Kansas City and Chicago were considered, but were finally discarded because they had no buildings adequate for the housing of a show of the magnitude of the tractor exhibit. Los Angeles and other western cities were held to be too inaccessible for a majority of persons interested in the industry. Los Angeles however, will be given support of the manufacturers in its local show.

Columbus finally was selected as best meeting all the requirements of the exhibition. The Ohio city is easily accessible, has a spacious new exhibition building and has been in the field for a national demonstration for the last five years. It is the center of four great agricultural states—Ohio, Michigan, Indiana and Illinois—and the show there will present the element of novelty which would be lacking in the other cities.

This is the first time one national show has been named by the National Implement and Vehicle association. In the past there have been a number of shows and demonstrations which have been staged by local associations with the sanction of the national body. It is expected that there will be numerous local shows next year as in the past.

GROCERIES SELL TIRES

New Orleans, La., May 18—Success is following rapidly the innovation of selling tires introduced all over the South by wholesale grocers a few weeks ago. A tremendous amount of business is being done with tires by these wholesale distributors of foodstuffs, according to George E. Burgess, manager of the tire department of the Albert Mackie Co., Ltd., one of the largest wholesale grocers in the South, located in New Orleans.

"We are distributing tires throughout Louisiana and Mississippi," said Mr. Burgess, "and have established a number of excellent branch lines with the retail grocer and other agents in both states, with only a small amount of territory still open. The whole territory is being covered with advertising of every description, and the roads are beginning to be covered, likewise, with the tracks of the tires we sell. The number of motorists who buy tires from us and from other wholesale grocers handling them, not only in the country, but in the cities and larger towns as well, is a revelation to a man who has always considered the sale of tires as an adjunct to the automobile-selling industry, or a separate business itself.

"I recently received a letter from a distributor of our tires from a retail grocer in one of the smaller towns in Louisiana, in which he said that he had been so successful with his tire sales that he was then planning to carry a line of other equipment and accessories. It seems that the retail grocers of the South soon will have to carry a stock of automobile tires, just as they once were compelled to carry all calibers of rifle and shotgun ammunition."

ORR HEADS IOWA DEALERS

Des Moines, Iowa, May 18—V. W. Orr, of the Waterloo Overland Co., Waterloo, Iowa, is the new president of the Iowa Motor Trades bureau, chosen at the recent annual meeting of the directors held in Des Moines. F. D. Parmer, of the Hughes-Farmer Co., Council Bluffs, was named vice-president, and G. W. Jones, of the Hudson-Jones Co., Des Moines, treasurer. A. J. Knapp, who devotes his entire time to the bureau, was re-elected secretary.

Starting the new year's work in an endeavor to secure closer organization of the motor trades, the Iowa Motor Trades bureau will divide the state into thirteen districts with a chairman in each district. The present county organizations will be maintained but it is thought the new plan of organization will permit of a better unification.

Denver Adds 353 Men To Trade Association Roll

**Enthusiastic Campaign Gives Colo-
rado 600 Members in Rocky
Mountain Association**

DENVER, May 12—In a week's intensive selling-the-big-cooperation-idea campaign just ended, Denver motor tradesmen have added 353 members to the Rocky Mountain Auto Trades Association. This brings the Denver share of the trades body's seven-state membership close to the 600 mark, according to Secretary and Business Manager Harrison Goldsmith. This figure represents about half of the association's present total membership, which Mr. Goldsmith reports as having doubled since the first of this year. District conventions and other special activities have aided the substantial gain outside of Denver.

The local campaign was conducted by a committee representing all branches of the automotive industry, and won a great deal of praise as a salesmanship achievement.

As a welcome to the new members and a vote of thanks to the campaign committee, a banquet was given in the Albany Hotel by the following twenty-one firms: Sharman Auto Co., Platt-Fawcett Motor Co., Great Western Motor Co., Tom Botterill, Inc., W. E. Hardy Motor Co., Mountain Motors Co., W. W. Barnett, Miller-Ray Motor Co., O'Meara-Green Motor Co., Cole Motor Sales Co., Quinn & McGill Motor Supply Co., Auto Equipment Co., MacFarland Auto Co., Wayne Oil Tank & Pump Co., Southwest Nash Motor Co., B. K. Sweeney Electrical Co., Norton-Buick Auto Co., L. E. Kelton Motor Co., Auto Sales Corporation and the Automotive Supply Co.

Four hundred and seventy-two tradesmen attended the event, which was enlivened by talks on better merchandising, improved service methods and cooperation, and by a wide range of entertainment features.

Among the speakers was General Sales Manager E. T. Strong of the Buick Motor Co., Flint, Mich., who pointed out many cases of careless merchandising urged loyalty to the entire automotive industry and declared practical, constant cooperation absolutely essential to establish and maintain the dignity of the motor car business and to bring about permanent success in the face of prejudice caused by carelessness and other obstacles.

The value of the affiliation with the National Automobile Dealers' Association, as a means to strengthen the standing of the automotive industry both nationally and locally, was urged by Regional Director Tom Botterill and other speakers. It was reported also that several of the new members had already enlisted in the national organization, and that membership campaigning will be continued in an effort to build up the membership of both the Rocky Mountain and the national trades bodies to the highest possible number throughout this entire territory.

1,000,000 Farm Truck Prospects, Finds Goodyear

Immense Sales Possibilities Uncovered By Questionnaire Sent Out by Rubber Company

DETROIT, May 17—1,000,000 immediate farmer truck prospects are seen by the Goodyear Tire & Rubber Co. As a result of 25,000 questionnaires sent to farmers, grangers, etc., over the entire country, to which replies from individuals and organizations indicate the attitude of some 42,000 of all classes of farmers, the Goodyear company has brought to light some interesting data as regards future sales of trucks to farmers. This information was the subject of a lecture given by D. M. Pettit, of the Goodyear truck tire department, who talked to a meeting of the sales managers of Detroit truck manufacturing concerns today. The research work was undertaken by the Goodyear company with the sanction and in co-operation with the United States Department of Agriculture. Great care was used in the preparation of the questionnaires, with the result that 20 per cent replies were received.

With exceptionally clear and convincing reasoning, Mr. Pettit based his suggestions upon the results of the questionnaire and upon the statistics of the Department of Agriculture. The total population of the United States has grown from 50,000,000 in 1880 to 106,000,000 in 1919, an increase of 112 per cent., while the urban population has increased 300 per cent. The producing population, that is, of the farm area, has increased but 45 per cent. On the other hand, acreage has increased 118 per cent and the number of farms 68 per cent.

The value of farm production last year was \$25,000,000,000. During the years 1917 and 1918 the increased cost to farmers was less in proportion than his increased receipts. In 1919, conditions were more nearly equalized in this respect and the farmers' clear profit was smaller on a percentage basis. In the year 1919 there were \$80,000,000,000 invested in farming.

Of particular interest to the truck sales managers was the fact that of the 5000 replies received, which represented a total of about 42,000 farmers, due to the replies from grangers, 44 per cent were considering trucks. There are 6,700,000 farms and it is estimated that the replies received were typical of the upper 2,000,000 of these farms and this would give about 1,000,000 immediate prospects for trucks. Of those who were prospective truck buyers, 42 per cent occupied farms between 100 and 200 acres and 52 per cent over 240 acres. Of all of the replies received 76 per cent were horse users and 26 per cent truck users. The votes in favor of the different capacities showed the 1, 1½ and 2-ton types to be in greatest demand, the 2-ton being called for on the larger farms.

In reply to answers asking why those believing in trucks did not buy them immediately, 33 per cent gave reasons which may be classed as financial and 11 per cent, due to inferior roads. On votes taken in favor of pneumatic or solid tires, 50 per cent wanted pneumatics and 45 per cent solid and 5 per cent wanted solid rear and pneumatic front. Regarding the usage of the truck, the biggest percentage by far hauled grain and live stock. Of the users of trucks, 69 per cent found in some way they were able to get better prices for their products due to the use of trucks for such reasons as increased range, less shrinkage in product and a great variety of other reasons. Of the truck users, 53 per cent haul farm produce for others, which indicates the possible market for rural freight in spite of many indications to the contrary.

DU PONT READY BY JUNE 1

Wilmington, Del., May 18—Du Pont Motors, Inc., of which E. Paul Du Pont is president, has begun the construction of a modern factory at Moore, Pa., on the outskirts of Philadelphia, where the company has bought a 10-acre plot of ground. The company is bringing out the new Du Pont automobile. The new factory, it is expected, will be ready for occupancy by midsummer, and in the meantime production will be carried on at the Wilmington plant.

The first Du Pont cars will be delivered about June 1. This new car is a four-cylinder job, to sell at \$4000. It is built for speed. The body lines are unusual. President E. Paul Du Pont announces that the three Du Pont models, the touring car, roadster and closed car, will all be in production by July. Production on the touring car and roadster starts next month. Du Pont distributors have already taken the entire output for 1920, so that there is no sales problem this year. The Du Pont chassis, when exhibited in the New York salon show and the Kansas City show, aroused the interest of the entire automobile world.

TRUCKS ENDANGERING CANALS

New Orleans, La., May 18—Owners of the five navigable canals entering New Orleans, over which, since time before the Civil war, fish, shell-fish, poultry, game and farm produce has been transported from the distant rural districts on schooners and power freighters and small steamers, to the markets of the Crescent City, are in a quandary as to just what their prospects are. In two or three instances, good roads have been built paralleling these canals, and motor trucks operated on these highways have almost immediately put the boat lines out of business. The canal owners cannot oppose the construction of improved roads, without laying themselves open to opposing the state's best interests, yet they see their canals becoming useless within a few months after the opening of such highways.

Water Shipments of Motor Cars Necessary

Southern Dealers Find That They Can Get Better Deliveries Than by Rail Or Overland in Spring

CINCINNATI, O., May 16—Shipment of automobiles by water to and from Cincinnati is on the increase.

Several southern dealers have made a practice of sending cars South by the river route, after they have been driven to Cincinnati under their own power, but not until this week did a large towboat pull into the Cincinnati harbor with six barges loaded with 500 automobiles for distribution under their own power out of Cincinnati.

The automobiles were built in a Michigan factory, shipped by water to Chicago and thence to St. Louis, then on to Cincinnati by river. The route, however roundabout, solved the problem of railroad transportation that confronted the Michigan manufacturers.

This is the first shipment that has come from St. Louis to Cincinnati by boat for several years and the sight was so unusual that old-time river men came down to the wharf to witness the arrival. The trip required four days.

When the towboat, which is the largest on inland waters, leaves Cincinnati it will carry another cargo of automobiles consigned to Memphis, Vicksburg and New Orleans for distribution at those points.

SYSTEMATIZE DRIVEWAYS

Hartford, Conn., May 7—Two enterprising Hartford dealers have systematized their driveways through the establishment of accredited representatives in the factory districts in the middle west. When the dealers are notified that cars await them they get in touch with their forwarding agents, who provide the necessary crews, handling the whole proposition on a fixed schedule for each driveway. The scheme has worked out very well, as it does not involve taking good men away from other important work. The field representatives also keep in touch with the factories and with the dealers in Hartford.

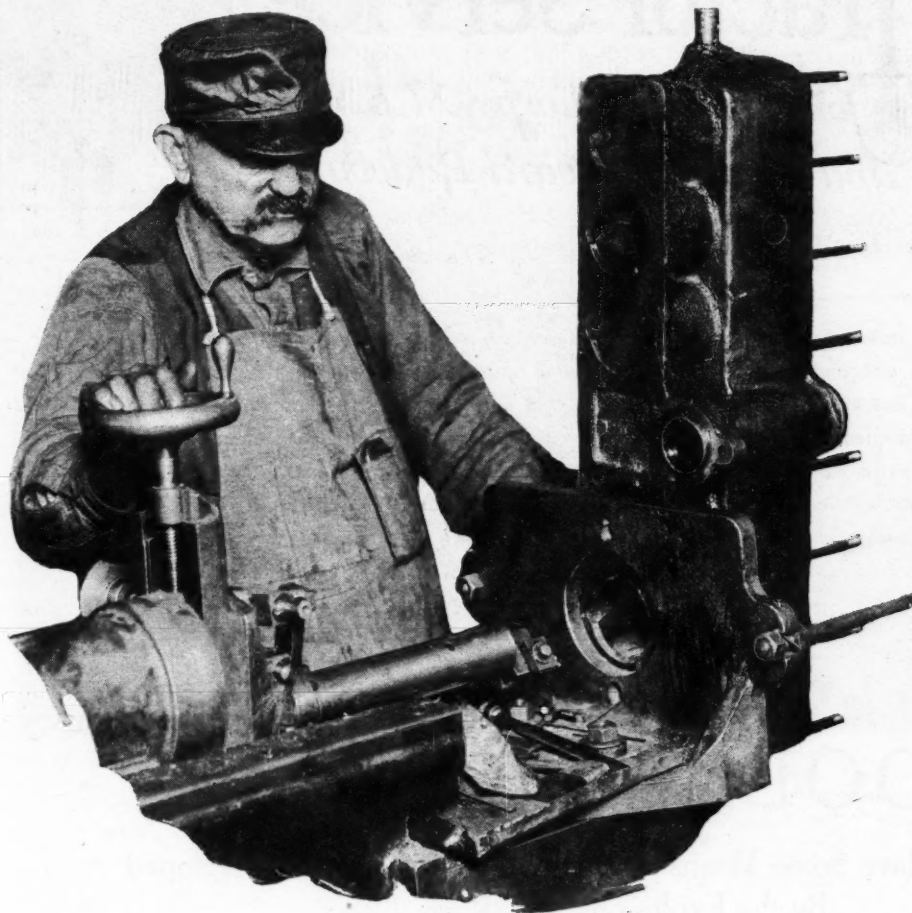
BURKE PLANS NEW CAR

New York, May 15—The Sheridan, an entirely new car to be built by the Sheridan Motor Car Co., a subsidiary of the Generals Motors Corp., at Muncie, Ind., will be on the market within ninety days. There will be four and eight-cylinder models. Experimental work on the lighter car has been virtually completed and soon will be on the eight. The prices have not been definitely fixed but the four will sell at around \$1800, and the eight for about twice that sum.

The Sheridan is the child of D. A. Burke, one of the old-timers in the Buick organization. He was branch manager in Chicago for four years.

Eagle Process for Scored Cylinder Repairs

Copper Strip Inserted in Dovetail Groove in Cylinder Block and Ground Flush with Cylinder Bore



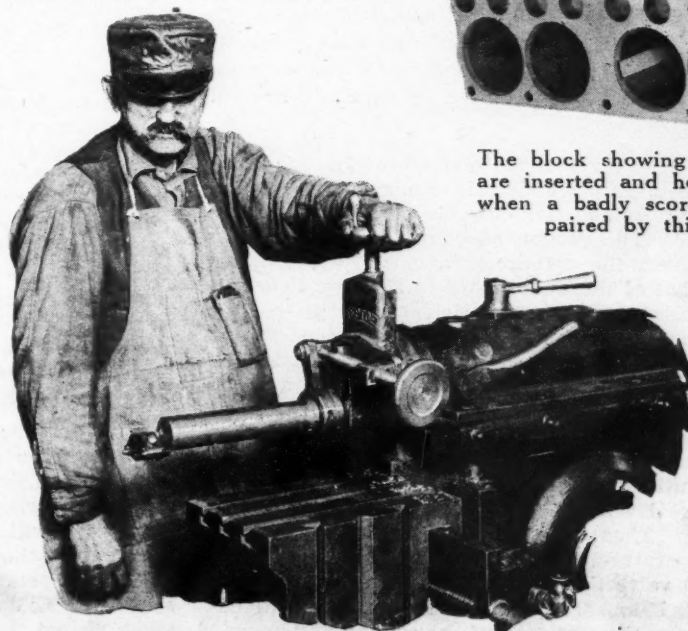
The shaper at work cutting the dovetailed groove in which the copper strips are inserted

ONE of the most distinctive processes for the repair of scored cylinders is that controlled by the Eagle Machine Co., 24 N. Noble St., Indianapolis, which consists of the inserting of a copper strip into a dovetail groove that is cut into the cylinder block with the aid of a shaper. Several distinctive advantages are obtained by this process. The same pistons and wrist pins and piston rings can be used after the cylinder is repaired. This makes it unnecessary to fit a larger piston in one cylinder which sometimes produces an unbalanced effect in the engine conducive toward extreme vibration.

Scores such as are caused by the loosening of a wrist pin, which can be seen in the illustration of the repaired cylinder block are quickly and economically repaired by this process. If the score marks are not unusually deep too small copper inserts can be fitted, but if the wrist pin has cut a large channel in the surface of the bore then it is better that one large strip be fitted.

A cylinder block is lined up on the bed of a shaper and held in place with a jig. The broaching tool is held in the holder of the shaper arm and the oper-

ator guides the movement of the block so that the tool cuts a dovetail groove in the cylinder. After these grooves have been cut a copper strip is fitted



The shaper and the cutting tool for cutting the groove

into the groove and is then ground perfectly smooth with the surface of the bore. The expansion of copper insures that the joint in the groove will always be tight.

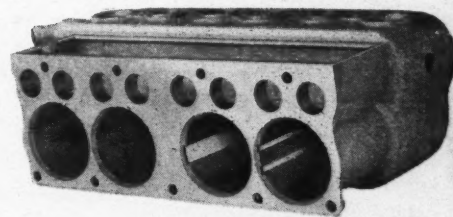
The Eagle Machine Co. is furnishing one day service on this process. Cylinder blocks shipped into the company are returned within twenty-four hours, completely finished. The company claims that because it is unnecessary to fit new pistons, rings and wrist pins, a saving of 50 per cent in the cost of refinishing the engine is made possible.

Splitdorf Four-Cylinder Five-Spark Magneto

IN attacking the heavy fuel problem for automotive vehicles, engineers have developed several fuel heating devices for obtaining better fuel vaporization. In some cases this is built into the carbureter. In others, an auxiliary device is attached to or surrounds the intake manifold. But in either case, an extra ignition spark in the heating chamber is required to start and maintain the partial combustion of the fuel.

When these devices first appeared it was common practice to use a series spark plug in the heating device, leading the spark from this plug to another in one of the cylinders. Thus one spark was required to do double duty.

Since in the Splitdorf-Aero magnetos only the negative sparks are utilized for cylinder ignition, the engineers of the company modified the standard four-cylinder Aero magneto to produce four sparks per revolution instead of but two, and to lead the four extra positive sparks through a fifth distributor terminal to the extra spark plug in the heating chamber.



The block showing how the strips are inserted and how they appear when a badly scored block is repaired by this process

Standard Mechanical Operations in Tractor Service

by John Charles Thorpe, M.E.
and Gustav Howard Radebaugh



EDITOR'S NOTE: The two pages herewith are the fifteenth of a series covering the service operations on tractors, although the same can be applied quite generally to passenger car and truck engines. In the last article in *MOTOR AGE* we told how to repair a leak in the gasoline supply pipe. This installment deals with the cooling system and shows in part the operations necessary to repair or replace a faulty pump impeller. These operations will be continued next week. The views should be studied closely and the tools used as shown. The operations are depicted in the approved manner and should be followed to secure the best results.

PART XV

THE COOLING SYSTEM

Why It is Necessary to Have Some Means of Carrying Away the Heat Developed
By the Explosions

THE continuous and energetic circulation of a plentiful supply of cooling water through the water jackets and radiator of the tractor engine, carrying away the heat developed by the explosion of the fuel, is a prime essential of proper operation. To the trained practical operator, the truth of this important principle has been illustrated and proven by his experience. However, the damage occurring from a lack of knowledge of the cooling system and carelessness in the supervision, offers evidence of the need for further study and exposition.

Great and violent changes of the temperature and pressure of the fuel charge takes place after it is mixed in the carbureter and enters the combustion chamber through the supply pipe and manifold. The suction effect of the pistons draws the fuel supply from the carbureter at a temperature that may vary from that of the atmosphere to 250 deg. Fahr. depending upon the pressure and efficiency of pre-heating devices that are now quite commonly used. The temperature rapidly rises as the fuel comes in contact with the hot manifold and combustion chamber walls. As it is compressed by the compression stroke of the piston it reaches a temperature of 900 to 1000 deg. at the point of ignition, when the pressure may vary again from 60 to 85 lbs. Almost upon the instant of ignition, the pressure rises to 250 to 300 lbs., with a temperature developed by the burning of the fuel from 3000 to 4000 deg. Then as the power stroke begins, the pressure and temperature drop off until at the point of opening of the exhaust valve the values have fallen to perhaps 40 lbs. and 1000 deg. Fahr. The exhaust temperature will depend, of course, upon the efficiency of the cooling system.

It will be seen that these high temperatures would cause a rapid deterioration of the related engine parts, if some accurate means were not used for absorbing this heat and dissipating it from the engine. Owing to the high temperatures lubrication would become impossible, the viscosity or cohesion of the oil particles having been overcome by the heat. The interdependent relation of cooling and lubrication is thus seen to be most intimate. It should be observed, also, that there is a great difference between the temperature at which the fuel enters the engine and its compression temperature. The raising of the fuel from the atmospheric temperature to this higher temperature requires work which is a real loss of heat, inasmuch as none of this work or heat is converted into mechanical power. It is thus clear, that the popular opinion that a cooling system is most efficient that keeps the radiator and other cooling surfaces at the lowest possible temperature, is in error. The cooling system is open to the atmosphere, and therefore that cooling system is most efficient and saves the most fuel that operates at the highest possible temperature without boiling over. This action will maintain all parts at a safe working temperature and will keep the heat losses at a minimum.

With an efficient cooling system the temperature of the working parts of the engine in contact with hot gases will not be much less, if any, than 500 deg. Fahr. With the constantly recurring high temperatures of the exploding fuel charges, it will be seen that, when the cooling system ceases to function the temperatures rise violently and rapidly to the danger point. The oil films established by the lubricating system break down with the inevitable results of "frozen" or stuck pistons, scored cylinder walls, burned out bearings, etc.

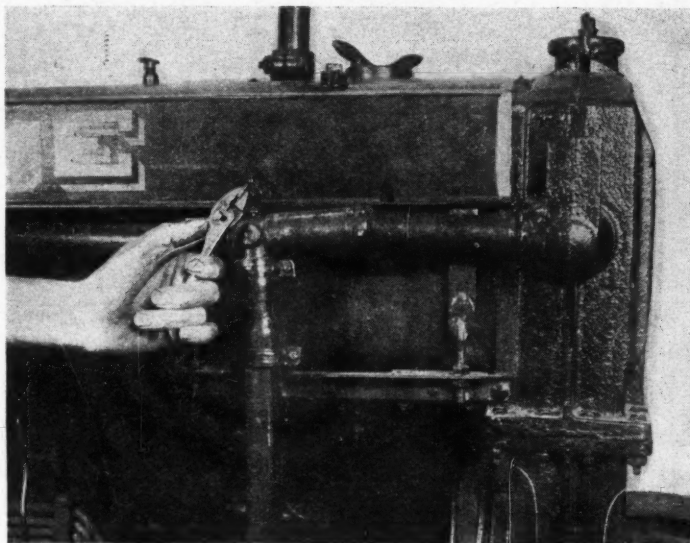
Locating and Repairing or Replacing Pump Impeller

The water circulation is maintained by a centrifugal pump, driven from a gear on the camshaft, by direct connection on an auxiliary shaft driven from a special gear assembled with the engine gears, or by direct installation on an extension of the crankshaft. In some instances, the pump is installed on what is known as the half-time shaft, whose principal duty is to drive the magneto.

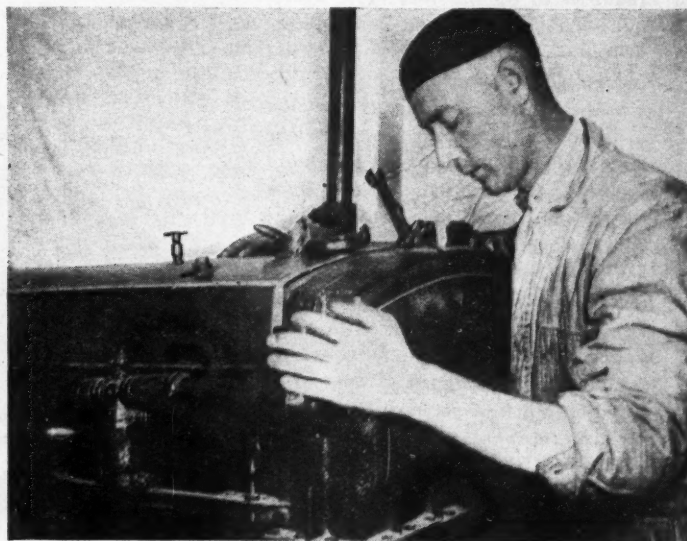
The pump, which is of the centrifugal type, draws the water through a proper connection from the bottom of the radiator and forces it through the water passages of the engine and

out into the top radiator section. Under the pump pressure it passes through the radiator tubes or honeycombs, where a great deal of heat is dispelled into the current of cold air passing over the radiating surface under the induced draft of the fan. It passes to the base section and is ready for a repetition of its cycle.

It will be seen that there is a lot of work for the pump to do. Occasionally, due to foreign matter getting into the pump, freezing or faulty material or workmanship, the key or pin, fastening the pump impeller to its shaft, breaks or shears. The repair involves an interesting service operation.



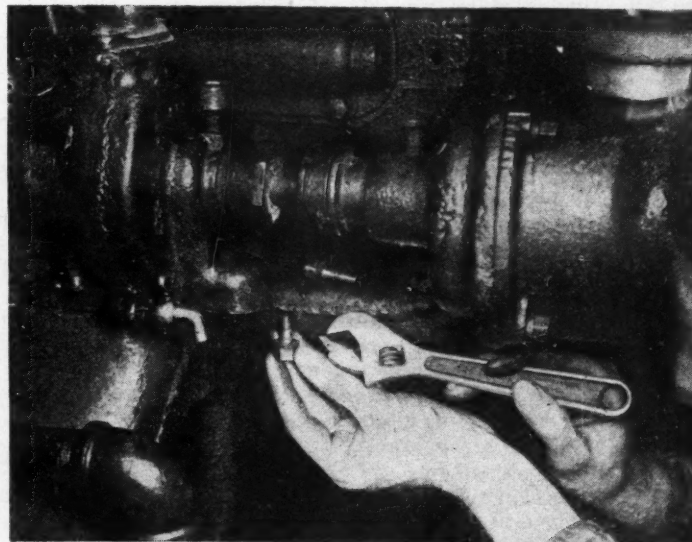
1. With engine running, open air-cock at high point in engine circulating system. If water spurts out, system is full; if not, stop engine and with cock open for the relief of possible air pockets, remove radiator cap



3. Replace radiator cap; start engine. After running two or three minutes, remove radiator cap and observe whether there is violent agitation in the water in the top of the radiator. If water circulates sluggishly, due only to the thermo-syphon effect, it indicates that the pump impeller is broken or loose on the shaft.



2. Fill circulating system through radiator, closing air-cock when water runs out. Water level should be an inch, more or less, below the overflow pipe opening. The reason for this is that when the engine starts the water will expand with the heat absorbed and this, together with the forced circulation of the pump, will tend to fill the radiator cap opening. The water will then escape through the overflow pipe, producing a perfect syphon which will "suck" the water out of the circulation system

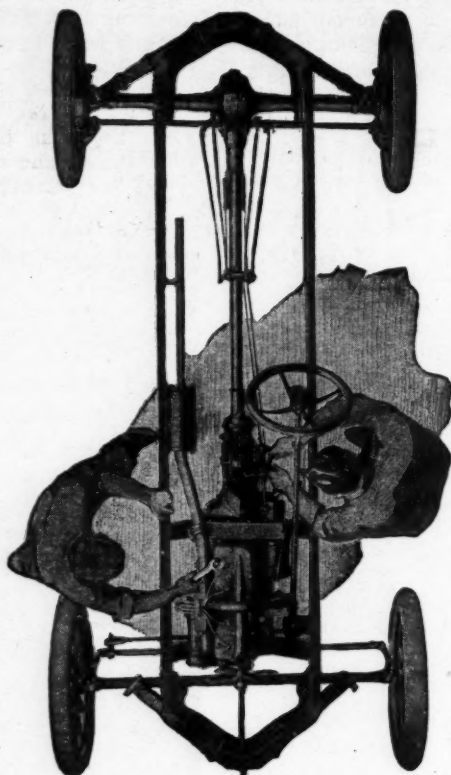


4. For convenience in making the repair, the pump assembly, including driving gear housing, should be removed from the engine. Disconnect all water connections after draining water from circulating system through drain cock at base of pump housing. Remove machine screws holding pump on engine base; and fastening the gear housing flange

Illustrations showing the operations in repairing or replacing a faulty pump impeller will be continued next week.

SERVICING THE OVERLAND FOUR

THIS is the fourteenth of a series of articles dealing with the service operation on the Overland Four. The work as it stands has been prepared by the Willys-Overland Co. and the dealer will find at the head of each operation the amount of time required to do the job. The operations have been put down in a step-by-step method so that one operation is logically followed by the next. This makes it possible for the service man to have on hand all the necessary tools and equipment before beginning the job. Incidentally, the time limit set for the job affords a ready means whereby the skill of the mechanic can be judged. Other things being equal it should not take a man longer to do a certain job than herewith mentioned, as the service department of the factory has established these limits after much experimenting. Dealers who are not keeping copies of MOTOR AGE on file are suggested to do so to get the benefits of this series.



Part XIV — Rear System

THESE valuable articles—Servicing the Overland Four—will run serially each week until the service operations on the entire car have been explained. This week deals with the

Rear System

Next week will a continuation of the operations on the rear system.

Keep a file of MOTOR AGE for ready reference. The flat-rate system of estimating on a job has been proved the best plan to make your service work more profitable, eliminate complaints and please your customers. The time given here for each service operation can be adapted to the flat-rate system of estimating cost of repair jobs on cars of this class.

TO REMOVE AND REPLACE PROPELLER SHAFT TUBE, PROPELLER SHAFT, PROPELLER SHAFT FRONT AND REAR BEARINGS AND BEVEL DRIVING PINION.

Time: To Replace Tube, 1 hr. 30 min.
To Replace Shaft, 1 hr. 45 min.
To Replace Bearings, 1 hr. 45 min.
To Replace Pinion, 1 hr. 30 min.

1. Take weight of car off rear springs, using chain falls or crane.
2. Remove cotterpins from axle spring bolt nuts.
3. Remove two $\frac{5}{8}$ in. nuts from spring bolts.
4. Drive out spring bolts.
5. Remove brake rod from brake pedal by removing cotter and clevis pin.
6. Disconnect hand brake rod from hand brake lever by removing wing nut.
7. With proper blocking, block up torsion tube and roll out rear system.
8. Remove cotter and clevis pins from all brake rods and remove brake rod assemblies.
9. Remove four $\frac{1}{2}$ -in. nuts and lock washers from torsion tube studs of rear axle housing.
10. Remove torsion tube assembly.
11. Loosen and drive out one $\frac{3}{8}$ -in. clamp cap screw, holding brake bracket on tube.
12. Drive off brake bracket from torsion tube.
13. Remove small lock screw locking rear bearing retainer in torsion tube.
14. Remove bearing retainer, using spanner wrench.
15. Pull out drive shaft with bearing and pinion.
To remove torsion tube front bearing use a long rod as a driving drift to drive out bearing.
To install new front bearing, fit bearing to propeller shaft and assemble in torsion tube.
To install propeller shaft rear bearing, remove cotter pin from pinion nut; remove nut; press off pinion. Remove pinion key and press off bearing; replace bearing on shaft; install pinion key, and fit tightly to taper. Tighten securely with pinion nut and cotter pin. This operation also covers replacement of pinion.

16. Install drive shaft in torsion tube, forcing rear bearing to its seat in torsion tube.
17. Install bearing retainer and clamp securely. If difficulty is experienced with noisy gears, it may be necessary to make correct measurements from the face of the rear axle housing torsion tube flange to the edge of the small ends of the bevel driving gear. The distance from the face of the torsion tube rear axle flange to the face or the small end of the pinion should measure the same as from the face of the rear axle flange to the edge of the small end of bevel drive gear tooth. If you are unable to measure this distance correctly, it will be necessary that the right hand side of the rear axle be removed. The pinion can then be adjusted by adjusting the pinion adjusting nut.
18. Install torsion tube on rear axle housing, clamping with lock washers and nuts.
19. Assemble brake bracket on torsion tube, clamping in position with one $\frac{3}{8}$ -in. cap screw.
20. Assemble brake rods with clevis and cotterpins.
21. Roll rear system under car—one man guiding propeller shaft into universal joint.
It may be necessary to place transmission in low gear, hand cranking the engine so that the splined end of the propeller shaft will slip into universal joint.
22. Put in left rear spring bolt.
23. Lower rear of car so that right rear spring bolt can be installed.
24. Put on spring bolt nuts.
25. Cotter pin.
26. Replace hand brake rod in hand brake lever connecting with wing adjusting nut.
27. Connect brake rod to service brake pedal with clevis pin and cotter.
28. Remove chain falls or crane.

TO ADJUST OUTER BRAKE

Time: 15 min.

1. Block front wheels.
2. With two jacks, jack up rear axle until wheels are free from the floor.
3. Start engine.
4. Throw transmission in gear.

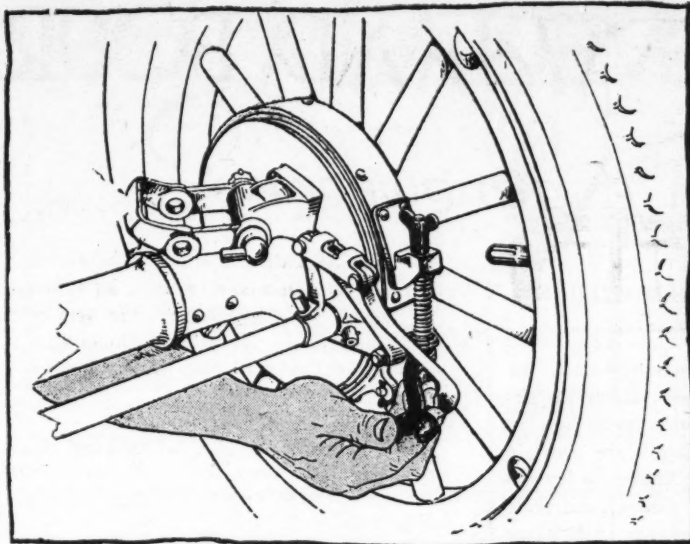


Fig. 28. Loosen adjusting nut preparatory to equalizing outer brakes

5. With mechanic operating brake pedal, inspect the action of the brake bands upon rear wheels.
6. The brakes should be so adjusted that both brakes take hold simultaneously. To insure brake band clamping brake drum evenly, loosen adjusting nut on brake adjusting rod directly under rod guide, as in Fig. 28, and tighten down on wing nut, as in Fig. 29.
7. When brakes have been adjusted properly, remove jacks from under rear axle.

TO REMOVE AND REPLACE OUTER BRAKE OPERATING TUBE OR INNER OPERATING CAM BRAKE SHAFT.

Time: 1 hr. 30 min.

1. Jack up rear wheel.
2. Remove hub cap.
3. Remove cotterpin from axle shaft nut.
4. Remove axle shaft nut.
5. Pull off wheel, using wheel puller.
6. Remove inner brake band.
7. Drive out $\frac{1}{8}$ -in. pin from hand brake lever next to rear axle center housing.
8. Remove cotter pins from brake tube lever clevis pins and remove clevis pins.
9. Pull out inner brake shaft.
10. Remove brake tube.
11. Set service brake tube in position.
12. Put in inner brake shaft.
13. Assemble inner brake shaft lever and pin securely to shaft, using a $\frac{1}{8}$ -in. by $\frac{7}{8}$ -in. pin.
14. Connect brake rods with clevis and cotterpin.
15. Install inner brake shoe, by assembling on anchor bolt, locking anchor bolt securely with $\frac{1}{2}$ -in. nut and cotterpin.
16. See that axle shaft key is properly placed in axle shaft.
17. Pack wheel bearing with cup grease.
18. Install rear wheel, locking securely with $\frac{5}{8}$ -in. axle shaft nut and cotterpin.
20. Install hub cap.
21. Remove jack from under rear wheel.

To replace brake shaft, follow foregoing sequence.

TO RELINE OUTER BRAKE BAND.

Time: 1 hr.

1. Jack up rear wheel.
2. Take off rear wheel hub cap.
3. Remove cotterpin from axle nut.
4. Remove axle nut.
5. With wheel puller, pull off rear wheel.
6. Remove cotterpin from outer brake band lever link pin.
7. Remove link pin.
8. Remove $\frac{1}{2}$ -in. nut and lock washer from brake band adjuster guide.
9. Remove cotterpin from brake anchor stud.
10. Remove brake band.
11. Remove brake band adjusting nut.
12. Remove cotter and pin from brake lever connecting lever to brake band.

13. Remove brake lever and adjusting rod assembly.
14. Cut brake band lining rivets and remove old lining.
15. Install new lining. Use pointed drift to punch holes in band lining—countersink holes sufficiently to draw rivet heads well under surface of brake lining to insure against rivet heads rubbing brake drum.
16. Assemble adjusting rod and lever assembly with pin and cotterpin at brake band end and with brake adjusting wing nut.
17. Put brake band assembly in position, slipping brake adjusting guide in hole and brake anchor bracket over brake anchor pin.
18. Put washer on brake anchor pin and cotter.
19. Put lock washer and nut on brake adjusting guide and tighten securely.
20. See that rear axle shaft key is in position on axle shaft.
21. Pack rear wheel bearing with grease.
22. Assemble wheel.
23. Put on rear axle nut and tighten.
24. Cotterpin.
25. Put in brake lever link clevis pin.
26. Cotterpin.
27. Block front wheels.
28. Jack both rear wheels off floor.
29. Start engine and place gears in speed.
30. Adjust brakes so that brakes are applied equally to each wheel.
31. Remove blocks and jacks.

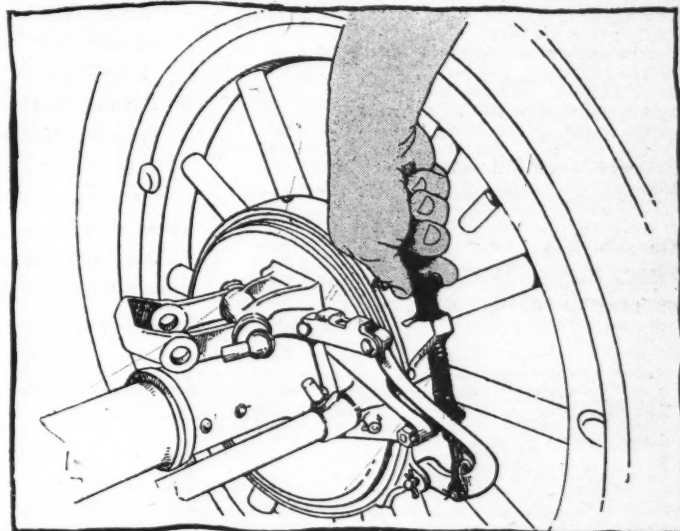


Fig. 29. Adjusting outer brake

TO RELINE INNER BRAKE BAND

Time: 30 min.

1. Jack up rear wheel.
2. Take off hub cap.
3. Remove cotterpin from rear axle nut.
4. Remove rear axle nut.
5. With wheel puller, pull off rear wheel.
6. Disconnect the two brake retracting springs.
7. Remove cotterpin and nut from brake inner band bolt.
8. Remove brake band.
9. Cut rivets and remove band linings.
10. Install new brake linings. Use pointed drift to punch holes in band lining—countersink holes sufficiently to draw rivet heads well under surface of brake lining surface to insure against rivet heads rubbing brake drum.
11. Install brake band.
12. Put in brake band pivot cap screw—tighten with nut and cotterpin.
13. Connect brake band retracting springs.
14. See that rear axle key is in position.
15. Pack wheel bearing with grease.
16. Put on rear wheel.
17. Tighten with rear axle nut.
18. Cotterpin.
19. Put on hub cap.
20. Adjust brake at hand lever with wing adjusting nut.
21. Remove jack.

Garage Planning

Service Station Arrangements

No. 223

LARGE SALES AND SERVICE BUILDING

We are contemplating immediate erection of a building to take care of our automobile business. A very rough pencil sketch is enclosed outlining in a general way our ideas. The lot is an inside one with 154 ft. frontage on a wide paved street and is 137½ ft. deep to a 25 ft. alley. A large garage building is on one side of us and a conservatory of music on the other.

We have never conducted a garage in the usual sense of the word and do not plan on taking outside work if it can be avoided. However we keep at least five men in servicing new cars, adjusting new cars that have recently been delivered and in overhauling and preparing used cars for the market.

An estimated amount of business to be handled for the ensuing year would be about \$30,000 per month of new cars, \$15,000 per month used cars and \$5,000 per month parts, all this at retail. In addition there will be perhaps \$15,000 a month new cars at wholesale where cars are taken single delivery. Shop income is negligible, being only emergency cases we have to handle as a matter of policy.

Our stock of used cars will average about twenty of which seven or eight will be ready for display at one time. We may possibly do our own painting, topping and install a small battery charging

CONDUCTED BY TOM WILDER

MOTOR AGE is receiving many inquiries for garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and readers are urged in asking for such plans to be used to include the following information:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.

plant. It is necessary to plan on storing as many as fifty new cars at a time. Parts stock runs about \$15,000.

We will thank you for any ideas or information that will help in working out proper plans and will be pleased to give you any further information desired.—R. D. Roper Motor Co., Phoenix, Ariz.

Your general layout is so good that we have made very few and but minor changes in it, confining most of our efforts to developing it.

The storage room for new cars would be better separated from the rest of the rear part, so that cars can be kept clean and in perfect condition until delivered. We have allotted enough space to this room to hold fifty cars when packed full, aisles and all, but the chances are that you will seldom have the whole fifty on hand, at least until the demand has slackened somewhat, so that you will have an aisle and two-thirds of the cars accessible most of the time.

New cars are serviced at the location you suggest, but the used car rebuilding shop is moved to the center so that the same shop equipment may be used for both departments.

In supporting the roof of this building two sets of abutting trusses may be used, one set extending from the front wall to the rear of the sales room, and the other from there to the rear wall.

Space for a top and trim department could be taken from the new car storage space or the paint and finish rooms could be reduced in size to make room for it.

In a plan so extensive as this you should certainly have a women's room not only for the accommodation of your customers but for your office women as well.

No. 224

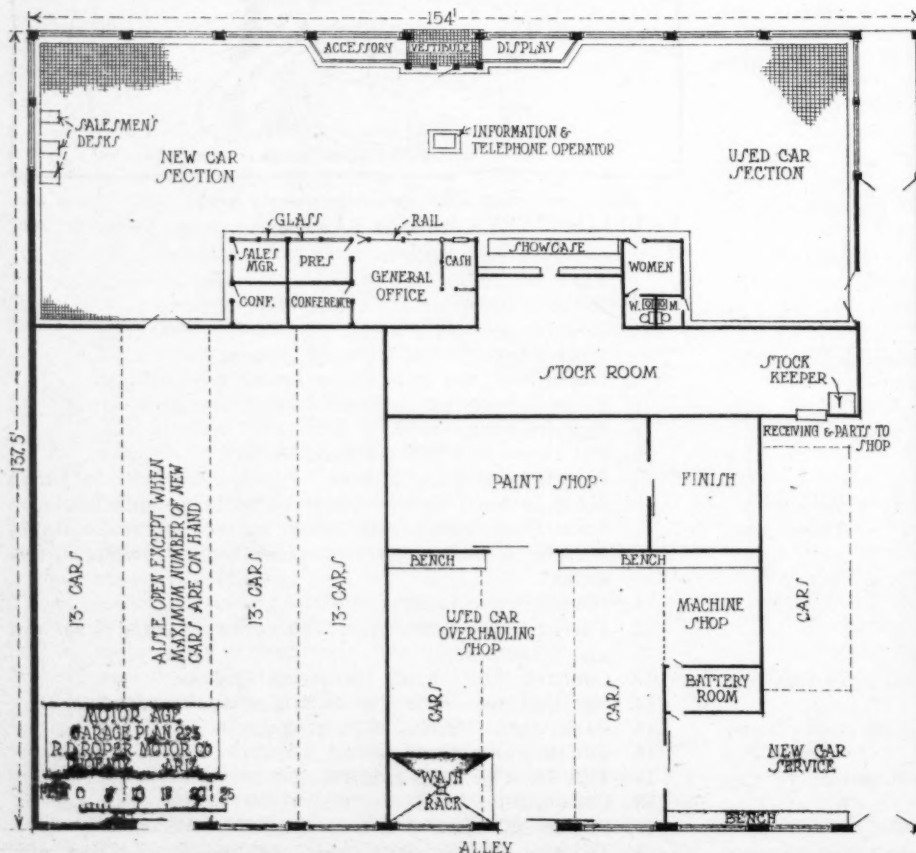
GARAGE WITH PRIVATE STALLS

Will you, at your convenience, kindly furnish me with a rough drawing for a garage 66x132 ft.

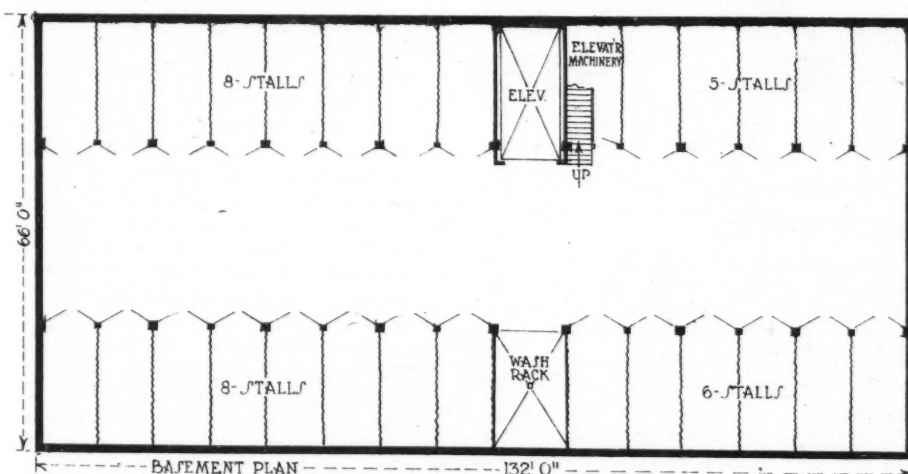
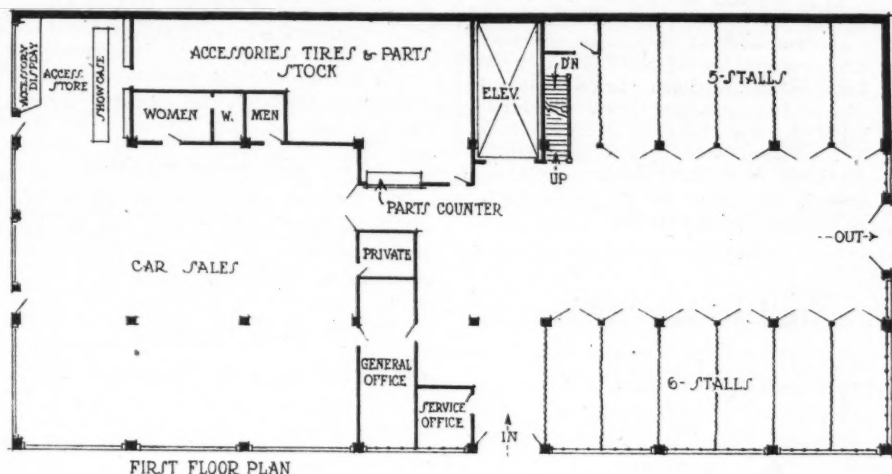
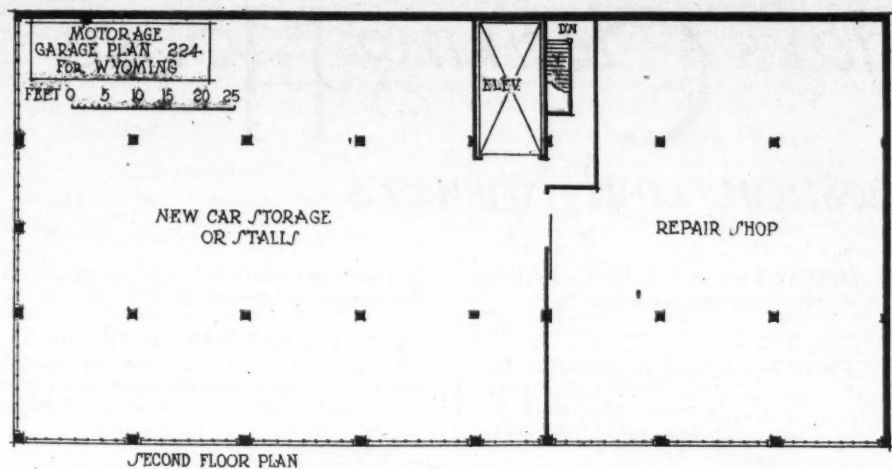
It is desired to stock just as many cars as possible and yet leave sufficient room for the operation of a repair shop employing five or six men, an automobile salesroom approximately 50x50, a small accessory and tire stock, and a storeroom with facilities for handling approximately \$2,000 worth of repair parts.

It is intended to make the building of reinforced concrete, with Fenestra wire glass windows on two sides and both Fenestra windows and brick on the remaining two sides. The building is to be two stories high with a full basement, and no provision should be made for a boiler or coal room, inasmuch as we have a central heating plant. The floors are to be of concrete.

Each car space is to be an individual stall with hog wire for the enclosing medium. It is desired that entrance to the service and repair departments be independent from the automobile salesroom, and that some provision be made for



No. 223. Large sales and service building



No. 224. Garage with private stalls

handling the service and repair customers in some sort of a special service sales-room.

I am enclosing a rough sketch showing the location of the lot, and would appreciate it if you would furnish me a rough plan for the building at your convenience, with your estimated cost for the structure.—Wyoming.

We are somewhat mystified as to your meaning when you say "Stock just as many cars," etc., if you refer to new cars, why do you want individual stalls? In order to have the stalls you limit your capacity very considerably. For instance, in the basement in a complete row of cars you could store three more cars without the stalls than with; then, too,

with your width you could double up the cars in two rows on one side. In this plan we have spaced the posts to accommodate the stalls; if the stalls are not used it would be better to change the spacing to 21 ft. or 14 ft. centers so advantage could be taken of the space.

The elevator location is such that it is very easy for cars to enter and leave the building and the aisles are sufficiently wide to make it easy to enter the elevator from them.

As prices go here this building would cost in the neighborhood of \$95,000, but this should not be construed as an estimate. The only way to tell accurately is to get figures from local builders.

Mechanics of Tomorrow

(Concluded from page 11)

the automobile industry. One sent four of his mechanics to specialize in ignition and highly complimented the school on the knowledge that was imparted to them. Nearly every class includes some of these men who are regularly employed during the day time. Mechanics from such firms as the Citizens' Motor Car Co., Leyman-Buick Co., Mason-Towle Co., Cadillac Co., Cunningham-Holmes Co., and O. Armleder Co., are at present, or have been in its classes.

The Harley-Davidson company is notifying purchasers of its motorcycles in this vicinity that the school has two of its machines on which applicants are taught motorcycle care and operation. The purchasers are told that they may take a five-weeks' course in motorcycle care and operation on these machines in this school, if they desire.

So far the school has handled about 1000 students, some of whom took only one five-weeks' course, some who took several of the short unit courses and some who are taking the complete two-year course. A number of these, the figures are not obtainable, are already in the industry. Several have gone into business for themselves, among them two accessory dealers who have recently opened up accessory shops of their own in Cincinnati.

The school is still in an experimental stage to a certain extent—its first class of two-year students will not be graduated until June, this year. But its popularity and success have been so thoroughly established in the short time it has been in existence, that assistant school superintendent Edward D. Roberts has characterized it as the greatest piece of vocational work in Cincinnati.

And Cincinnati—leading educators have said on numerous occasions—is taking the lead among all cities in the country in the development of a complete vocational program in the schools.

A Talk on Accessibility

(Concluded from page 9)

in a position so close to the exhaust pipe, that rather than chance a burned hand, one would rather leave the cup unfilled.

How far should this accessibility go? Some men who ought to know, have the idea that accessibility can be carried too far. For example, if a transmission were so designed that by removing six or eight accessible bolts, it could be lifted out, the contention is that good performance would not result. "Too flimsy—five of the six bolts might become loosened and the transmission would fall out of its own accord." Thus runs the thought. We do not feel that the argument holds water. The whole question is one of careful and thoughtful analysis. Attention to the details and these difficulties can be overcome.

The Readers' Clearing House

Questions and Answers

THIRD BRUSH REGULATION

Q—Explain the action of the differential generator used on Chevrolet, model F.E.?

2—Since the power of an electric motor depends on the magnet field and the magnet armature, why wouldn't there be some power if these members were permanent magnets and without current?—E. W. Speck, England, Ark.

1—The generator used has third brush regulation. Full details as to the action of this type of generator and its control was published in the March 25 issue of MOTOR AGE.

The regulation obtained from the third brush is dependent upon armature reaction, which in turn is caused by the shifting of the field flux around the commutator. This piling-up effect on the field flux is illustrated in Fig. 1. The first diagram shows the normal position of the lines of force produced by the generator field when the armature speed is slow just after the point of generator cut in. As the generator speeds up, the lines of force tend to follow the armature around as it rotates. This causes the magnetic lines to crowd closer together at the pole tip at the point where the armature passes out from under the pole. The second diagram in the series shows this. Still higher speed produces a greater crowding of the lines of force at the pole tip. The effect of this crowding together is in a way the effect that would be produced by decreasing the voltage impressed across the shunt field.

Now instead of connecting a resistance in series with the field and controlling it manually, the same effect can be obtained by using a third brush which makes contact with the commutator at a point where the armature reaction will produce the greatest change in the voltage. This position will be found near either of the two generator brushes just in front of the brush where the commutator passes under the main collecting brush.

The last illustration in the series shows the approximate position of the lines of force when the generator is revolving at a very high rate of speed, approximating a car speed of 60 m.p.h. In this position the field flux has so reacted with the normal flux produced by the armature itself that an intense cross-magnetizing field is produced, which is so strong as to completely dis-

CONDUCTED BY ROY E. BERG

Technical Editor—Motor Age

THIS Department is conducted to assist Dealers, Service Stations, Garagemen and their Mechanics in the solution of their repair and service problems.

In addressing this department readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been asked by some one else and these are answered by reference to previous issues. MOTOR AGE reserves the right to answer the query by personal letter or through these columns.

The Electric System

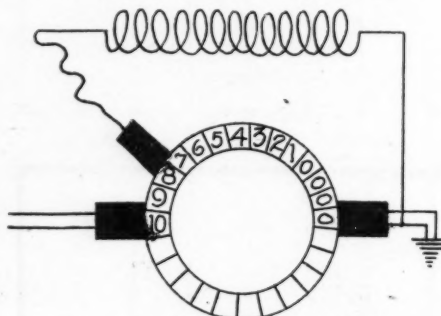


Fig. 2—Characteristic layout of the third brush regulation

tort the lines of force of the field. With the lines of force in this position the voltage impressed across the shunt field is very small, producing, of course, a very much smaller output. Fig. 2 shows the characteristic layout of third brush regulation.

2—True enough, you can demonstrate the principle of the electric motor in a simple way by the use of a permanent magnet for the field. No measureable amount of power can be obtained without the use of electro-magnetic fields and considerable current sent to the armature through the brushes.

APPERTSON WIRING DIAGRAM

Q—Publish wiring diagram of the 1917 Apperson.—Harry Morey, Joliet, Ill.

The Gray and Davis wiring on the 1917 Apperson is shown in Fig. 3.

STANDARD WIRING SYMBOLS

Q—Publish the standard symbols as used in wiring diagrams of motor cars and trucks.—W. B. Wheatley, Hartford, Conn.

Shown in Fig. 4.

GRANT WIRING DIAGRAM

Q—Publish wiring diagram of the 1916 Grant Six.—Frank Hoeber, Seneca, S. D.

This diagram was shown on the wiring diagram page of the April 29 issue of MOTOR AGE.

COLUMBIA WIRING

Q—Publish wiring diagram showing how to install side lights on a Columbia Six, single contact system.—A. Zakroizynski, Chicago.

This is shown in Fig. 5.

Engines

SEIZED PISTONS

Q—Due to lack of oil the pistons in an eight-cylinder Cadillac have seized. How can this be remedied?—Max Johnsen, LaPort City, Ia.

Be sure first of all that it is the engine and not some other part of the transmission or differential that is at fault. To test this jack up the rear wheels, release the emergency brake and place the gear shift lever in neutral. The wheels should turn freely and there should be no binding in the rear axle system. If the engine is at fault, the spark plugs should be removed or the pet cocks opened to relieve the compression. Then if the crank cannot be turned over by hand, by means of the starter, or both, the car may be towed with the gears in high and the clutch disengaged. As soon as the car has attained some momentum, allow the clutch to engage gently. Great care should be taken in doing this, as a sudden motion might strip the gears or even break a shaft. If this will not free the pistons, pour kerosene into the cylinders and allow it to remain about two hours. This will have a tendency to loosen any oil that may have gummed the pistons to the cylinder walls. Repeat the process given above. After the engine has been turned over drain out this mixture of kerosene and oil which has collected in the bottom of the crank-

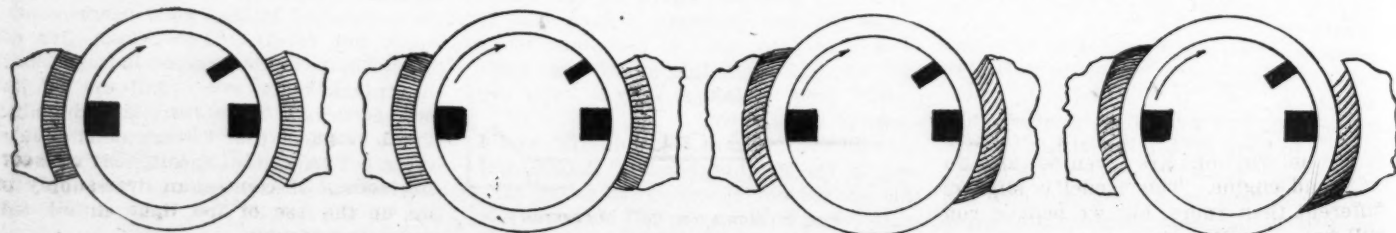


Fig. 1—Showing piling up effect of the field flux

case. New oil should then be added, the radiator filled with hot water to expand the cylinder and the spark plugs replaced. After starting the engine should be run slowly under its own power for some little time.

CRANKSHAFTS

Q—Explain the operation of crankshafts in any eight-cylinder engine.

2—Explain the expression, sleeve valve engine.

3—Publish formula for figuring the horsepower of a motor car.—H. E. Williams, Mineral Ridge, Ohio.

1—One crankshaft which is no longer than the crankshaft of a four-cylinder engine is used. It is of the same form as that of a four, the throws being in the same plane. There are eight power impulses or explosions, during each cycle of two revolutions of the crankshaft. In other words, the four strokes, or two revolutions are just the same as in a four, but there are eight impulses or explosions during these two revolutions. There is a power impulse every quarter turn of the crankshaft, and thus there is no intermission then, but rather an overlapping.

2—The sleeve valve is the type of engine designed by Knight; and is known as the Knight engine. The main feature of this engine is the substitution of sliding valves for the usual poppet or tappet valves.

3—The N. A. C. C. horsepower formula for figuring the horsepower of motor cars is as follows: $D^2 \times N \times .4$, where D is the bore in inches and N the number of cylinders.

PISTON CLEARANCES

Q—What is the proper clearance for pistons in a heavy duty kerosene burning engine with two 10x12 in. cylinders? Give both head and skirt clearances. What is the proper clearance between the ends of the rings?

2—Is there any way to raise the compression on a Fordson tractor engine to compensate for altitude?—Sam E. Eakin, Jerome, Idaho.

1—The latest recommended piston clearances were given in the April 15 issue of MOTOR AGE.

2—This can be done by installing new pistons with a longer skirt. You will have to purchase these pistons from some firm that manufactures pistons.

FLEXEDGE VALVES

Q—Are Flexedge valves as satisfactory as the makers claim? How long do you think they would last?

2—Explain by steps the work of raising the engine of an Overland, model 90.

3—Publish the names of a few engines that have the crankshaft fastened to the cylinder block. Also the names of some that use a base.

4—Explain the workings of the stationary Primm engine. Also how the ignition is furnished?—E. W. Speck, England, Ark.

1—So far as we know, these valves have proven highly satisfactory. It is impossible for us to state how long these valves will last, as we have never had any reports on this question.

2—In the March 25 issue of MOTOR AGE, in the article "Servicing the Overland Four," instructions are given to raise an Overland engine. This model is slightly different than yours, but we believe you will have no difficulty.

To assist readers in obtaining as a unit all information on a certain subject MOTOR AGE segregates inquiries in this department into divisions of allied nature. Questions pertaining to engines are answered under that head and so on.

THE ELECTRIC SYSTEM

E. W. Speck.....England, Ark.
Harry Morey.....Joliet, Ill.
W. B. Wheatley.....Hartford, Conn.
Frank Hoebert.....Seneca, S. D.
A. Zakroczynski.....Chicago

ENGINES

Max Johnsen.....LaPorte City, Ia.
H. E. Williams.....Mineral Ridge, Ohio
Sam E. Eakin.....Jerome, Idaho
E. W. Speck.....England, Ark.
Ross H. Bell.....Buckingham, Ia.
Frank Miller.....Dayton, Ohio

LUBRICATION

J. A. House.....Dyer, Tenn.
J. Boren.....Chicago

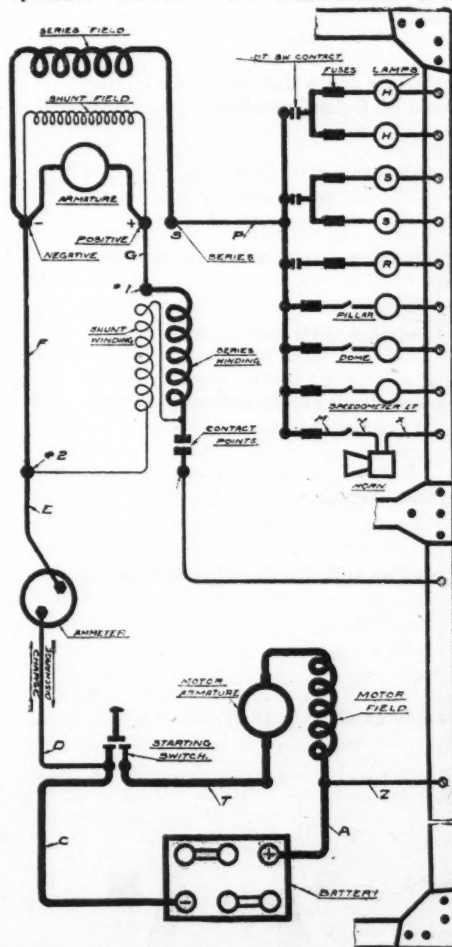
MISCELLANEOUS

J. L. Holtwich.....Tebbetts, Mo.
Ura P. Hayes.....Eckford, Mich.
Elmer Durman, Jr.....San Francisco, Cal.
Frank Hoebert.....Seneca, S. D.
J. M. Marchin.....Chicago
E. W. Speck.....England, Ark.
C. E. Dauwalter, Automotive and Farm Service Co.....Carver, Minn.
Twin Oaks Garage.....St. Paul, Minn.
T. J. H.....Roanoke, Va.
Frank Miller.....Dayton, Ohio
Arch F. Alspach, Hudson Alspach & Co.....Convo, Ohio
W. S. Robinson.....Minneapolis, Minn.
O. E. Speer.....Marion, Ind.

CARBURETION

J. C. Graff.....Chicago
A. W. Turpin.....Molson, Wash.
Frank Miller.....Dayton, Ohio
C. J. Thompson.....Almena, Kans.

3—We do not know of any engines that have the crankshaft fastened to the cylinder block. The crankshafts are



Gray & Davis on 1917 Apperson
Fig. 3

fitted in a frame which is the upper half of the crank case.

4—We have no information on this engine, but in all probabilities the ignition is make-and-break or a low tension magneto with an induction coil.

ENGINE MISSES

Q—A 1916 Ford when on a pull acts as though the gasoline line were clogged, but everything seems to be clear. The trouble started with just an occasional miss on a pull, but now it will pull scarcely half a block until it begins to miss and then it acts as though it would stop altogether. It makes no difference whether the engine is running fast or slow. This also occurs when driving with the throttle two-thirds open, for any distance. At first it seems to operate all right, but in a short time it acts as though there was an insufficient gasoline supply. As soon as the low gear pedal is depressed on a hard pull and the engine is allowed to run faster the difficulty seems to disappear. A new Holley carburetor was installed, with no improvement. The float level was also raised as high as possible. The valves were ground and carbon removed. A new timer was also tried, but there is no improvement. The spark plugs are apparently in good condition, but the first and third cylinders are slightly scored. The missing does not seem to occur in any particular cylinders. Is it possible that the intake valves leak back into the intake manifold and fouling the mixture on a pull? The engine does not seem to boil the water. Sometimes it does not pick up from a low speed without faltering. It seems to work better on a rich mixture.—Ross H. Bell, Buckingham, Iowa.

This may be caused by poor commutator contact, leaky valves that cause poor compression, air leak in the intake manifold, weak exhaust valve spring, too much gap in spark plugs, vibrator out of adjustment or points dirty or burned. The only way you can eliminate the trouble is to find it by a process of elimination and make the necessary adjustments.

POWER CURVE

Q—Publish power curve of 1917 Studebaker Four.

2—What is the maximum speed of 1917 Studebaker Four in m.p.h.—Frank Miller, Dayton, Ohio.

1—Power curve of the four-cylinder Studebaker is shown in Fig. 6.

2—Under average conditions the maximum speed is 50 m.p.h.

Lubrication

OIL PUMPING

Q—Instruct how to prevent a 1918 Oakland Six from pumping oil. We have installed new rings and pistons, but these do not help. We have been told if we would cut the connecting rods and lower the head of the piston with the bottom opening of the spark plug that this would stop our trouble. Would this affect the running of the engine? The top ring on the piston comes up in the opening for the spark plug and it deposits the oil in the plug.—J. A. House, Dyer, Tenn.

Several things are responsible for oil passing by the piston rings. Of these, the following are most common: Scored cylinders, scored pistons, worn or poorly fitted rings, worn pistons or cylinders, improper valve timing and bent connecting rods. Of course, an over-supply of oil or the use of too light an oil will cause this trouble.

Before attempting a remedy a thorough inspection should be made of the entire power plant to ascertain just which ailment is responsible. If the engine is of that type, remove the head. Crank the engine until any piston rests on lower dead center. Clean the cylinder wall thoroughly with kerosene and observe whether scratches or deep cuts are visible on the cylinder walls. It can be taken for granted the pistons and rings also are cut, and it will be necessary to remove them.

If the cylinder walls are found to be free from blemish, crank the engine again until any piston rests on top dead center. Place the hand on the top of the piston and try to move it from one side of the wall to the other. If the piston shows it has more than 0.005 or 0.006 in. play, it is certain the pistons and cylinders have worn to the extent that oversize pistons are necessary. To be accurate it would be necessary to

measure the cylinder walls at different angles throughout the depth of the cylinder. This is done with inside micrometers. The result is very apt to reveal the cylinder is worn egg-shaped, as it commonly is termed. If the pistons or cylinders are scored or if the cylinders are worn egg-shaped, it is necessary to regrind the cylinders and fit new pistons. If the cylinders are not too badly worn or the scratches not too deep, it is possible to procure a satisfactory job by lapping or grinding. If the cylinders are in such condition that this operation will not bring them back to perfection, it is necessary to rebore them.

If the pistons and cylinders are in apparent good condition, try the rings for wear or poor fit. To do this requires that the pistons be removed. While the piston is out, carefully observe whether it indicates a bent connecting rod, shown by a discoloration resulting from heat on the upper side of the piston and a like

discoloration on the bottom and opposite side. This defect, besides permitting oil to pass the rings and wearing the cylinder out of round, will cause an engine knock which is very hard at times to locate. Clamp the connecting rod in a vise and grasp the piston preparatory to working it up and down to determine excessive wear at that point. Remove the piston rings and place them in the cylinder. A gap of not more than 1-64 in. should be allowed, and if more than that is noticed the ring is useless.

If the cylinders require reboring or regrinding, new pistons and rings will be necessary. The pistons when properly fitted will leave 0.004 in. to 0.005 in. clearance.

OIL TESTS

Q—Publish a simple method for testing engine lubricating oil.—J. Boren, Chicago.

Various factors have to be considered in determining the actual value of lubricating oils for the exacting work required of them within the internal combustion engine. While really simple tests are out of the question, there are some things that can be done with very little trouble which will stamp an oil as good or bad.

Depending on whether or not an oil properly fulfills the functions for which it is put into the engine, the latter either will run efficiently or will be reduced to such a condition that it soon must be repaired.

The reaction known as the heat test is very simple to make with any lubricating oil. Simple though it is, perhaps there is no other test which indicates so decisively and so quickly the purity and degree of refining of an oil, as well as its durability, when such an oil is subjected to the extremely high temperatures met within internal combustion engines.

The heat test consists of heating a sample of oil to a temperature of between 300 and 500 degrees Fahrenheit—depending upon the flash point—and holding same at this temperature for a period ranging from 10 to 15 min. Two distinctive results are obtained:

First, a good durable oil shows a slight darkening from its original color, the change in color being only to a darker shade, the oil still remaining clear and without sediment.

Second, a poorly refined and impure oil shows an immediate alteration in color, quickly changing to a dense black. As the heat is maintained, a black precipitate settles out. The quantity of the precipitation depends upon the impurity of the oil.

Just as different samples of oil, good or bad, retain their color or blacken during the heat test, just so will be their reaction when exposed to an even higher temperature in an explosion engine, and it is reasonable to conclude that a continuous precipitation of black sediment in impure oil will rapidly destroy its lubricating properties, and within a short time be the cause of costly wear of all parts in moving contact.

The emulsion test shows the quality of lubricating oils about as accurately as does the heat test on straight or blended

COMMON WIRING SYMBOLS

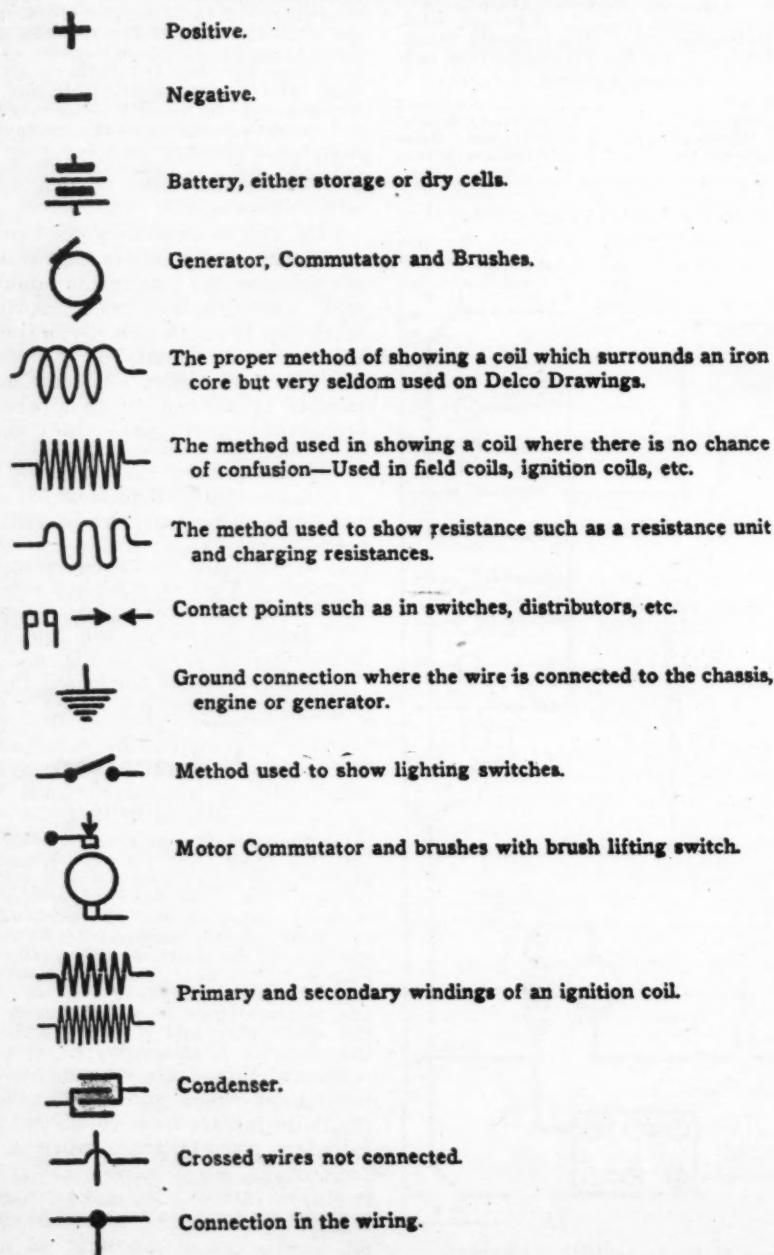


Fig. 4

hydro-carbon oils only. Wherever animal or vegetable oils are present, this test ceases to be reliable.

The emulsion test consists of vigorously shaking a sample of oil with about an equal volume of water in, say, a 4-ounce bottle, and allowing same to stand for 24 hours after shaking. The results are:

First, a good, durable oil shows a very slight white line of demarcation where the oil meets the water below it. The water upon which the oil floats may be clear or slightly cloudy in appearance, thus showing the absence of acid compounds.

Second, a poorly refined oil will be seen to have emulsified or permanently mixed with the water, and to have formed a semi-fluid, reddish-white or brownish-white mass, containing a slight layer of globules of oil. This curdled mass extends nearly to the bottom of the bottle and floats upon the remainder of the water, which is a milky white. Emulsification shows the presence of acid products.

To test on the road let all oil be drained from the engine to be tested and the oil to be tested put in, the exact weight in pounds of oil put in being carefully recorded. The amount of gasoline should also be ascertained, and a reading of the speedometer taken. Then let a test be run over an average road, including steep hills, straight level stretches, etc., for a distance of some 50, or even 500 miles, if desired. At the end of the run all oil should be drained from the engine and weighed, the amount of gasoline used determined, as well as the exact total distance covered. The number of miles per gallon of fuel and oil can then be found by dividing the total mileage by the quantity of fuel or oil in gallons.

In order to determine the relative value of another kind or grade of oil in the same engine, a similar test should be run for the same distance, and under the same weather conditions over the same roads.

Miscellaneous

PUMP LOSES PRIME

Q—What causes a Bowser pump to lose prime over night?

2—How can it be prevented from leaking?

Where can repairs for same be secured?—J. L. Holtwich, Tebbetts, Mo.

1—There are three possible causes which might effect the trouble you are having with your Bowser tank. Possibly a combination of the three causes are combined, at any rate we advise that you examine the following parts: The foot valves. All parts for sediment deposition, and all parts for corrosion. The cause for a complaint of this kind is frequently due to improper installation. There is a possibility that the dirt may get into the tank through the flange openings, at the time the installation is made. It is possible that the cement which is used to connect up the suction line has been applied in excess quantities which would cause some of it to dislodge and

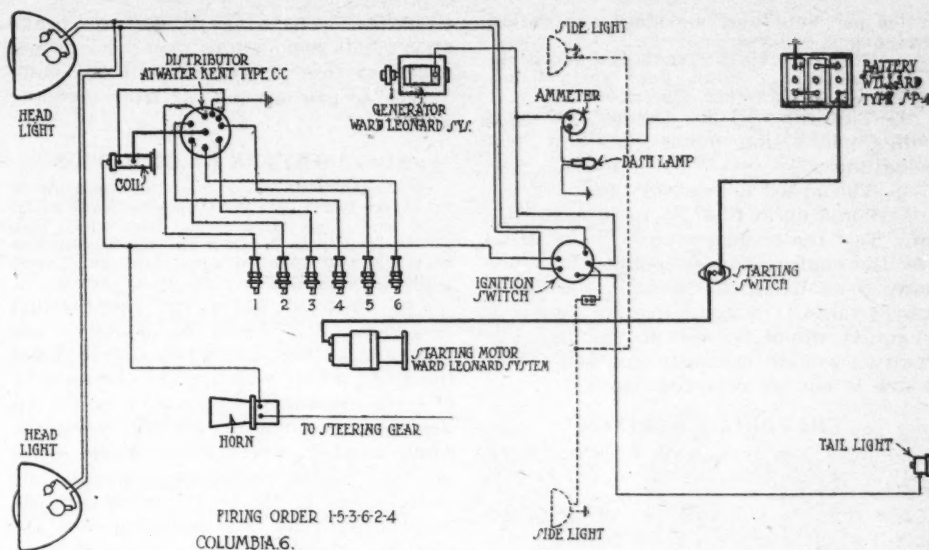


Fig. 5

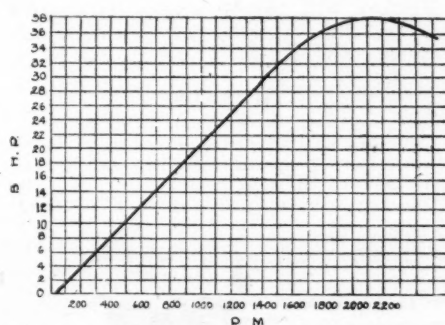


Fig. 6—Power curve of 4-cylinder Studebaker engine

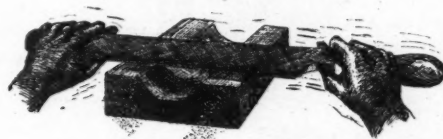


Fig. 7—Illustrating method of draw filing

thus accumulate and lodge on the valve seat. This would allow the poppet valves to be held open slightly, which would allow a little gasoline drain back.

2—To remedy a condition of this kind, the foot valves should be removed and cleaned. It is always best of course to test them before replacing. They can be ground with valve grinding compound, just as the valves of an engine are ground. It is very easy to tell whether or not the trouble is with the foot valves, for after priming, if the pump measures correctly, then the foot valves are all that are involved in the complaint. If at no time the pump registers correctly, then you should examine the suction line and look for a leak. The least amount of air that enters the suction line will affect the accuracy of the pump.

3—Repairs for this pump can be had by writing the S. F. Bowser & Co., Inc., Ft. Wayne, Ind.

KEROSENE AND ETHER

Q—Would ether mixed with kerosene make a good substitute for gas?

2—If so, how much ether would be necessary per gallon of kerosene?

3—Would there be any danger of getting the solution too strong with ether?—Ira P. Hayes, Eckford, Mich.

1—We do not advise the use of ether in any form in fuel. The use of ether is like the drug habit for it will surely ruin the engine in time. Kerosene is being used successfully at the present time just as it is. At a recent meeting of the S. A. E. it was pointed out that in a good many respects, kerosene is a better fuel than gasoline.

2 and 3—See 1.

CONDENSATION

1—What causes water to drip from the exhaust pipe of a Cadillac or Packard?—Elmer Durman, Jr., San Francisco, Calif.

This may be caused by condensation of the moisture in the air. You do not state on just what part of the exhaust pipe this occurs, but the exhaust in some parts of the pipe is not very hot. This would mean that if the air was cooler than the pipe and very moist there would be a collection of moisture that is condensed on the exhaust pipe. This may also be a combination of lubricating oil and gasoline that has worked into the pipe when the engine was missing.

LACK OF SPEED

Q—A 1916 6-cylinder Grant does not seem to be working properly. It will not go over 36 m.p.h. It has been overhauled, new piston rings installed and the valves ground and carbon removed.—Frank Hoebert, Seneca, S. D.

The fact that it will not go over 30 m.p.h. does not indicate that there is anything wrong with the car. Lack of speed may be a result of poor carburetion, retarded spark, poor compression, leaky exhaust valves, wrong valve timing or a slipping clutch. Of course it is impossible to state the exact cause of your trouble, but if the things mentioned are checked carefully the car ought to make at least 50 m.p.h. under average conditions.

ENGINE CHANGES

Q—What mileage should be obtainable on an overhauled 12-cylinder Pathfinder in which new piston rings have been installed, piston pins reground, valve timing correct, and Stromberg carburetor adjusted? Present speed not over fifty

miles per hour and consumes one gallon gas every 6 miles.

2—How can we increase the speed up to 75 miles per hour, gear ratio being 56x13.—J. M. Marchin, Chicago.

1—This car will not give over about 8 miles per gallon under the very best conditions.

2—The speed seems very low for the car should do at least 65 to 70 miles per hr. Test the compression. In overhauling the engine the new pistons may not have been installed correctly and as a result there is a great loss of compression. It would be well to examine the ignition system carefully and see if the spark is not set retarded too far.

CHEVROLET SPRINGS

Q—Does any company fit Chevrolets with semi-elliptic springs?—E. W. Speck, England, Ark.

Not that we know of. In order to do this it would require a great deal of work and the design of the present spring suspension would have to be changed. We do not think this change is warranted, as it upsets the purpose of the designers of the car.

CREEPING

Q—What is wrong with a Ford that creeps forward when starting? It has been overhauled and when the emergency lever is in neutral the car can hardly be moved; this condition also existed before it was overhauled. The bands are tight and the three dogs which work on the high-speed clutch are loose when the lever is in neutral. As yet there is no oil in the engine, so, so it is not because the oil is too heavy. First we put in a thick disk and then a large disk on top; smoothed the clutch disk drum and brake drum.—C. E. Dauwalter, Automotive and Farm Service Co., Carver, Minn.

This is probably caused by having the low speed band being set too tight. It

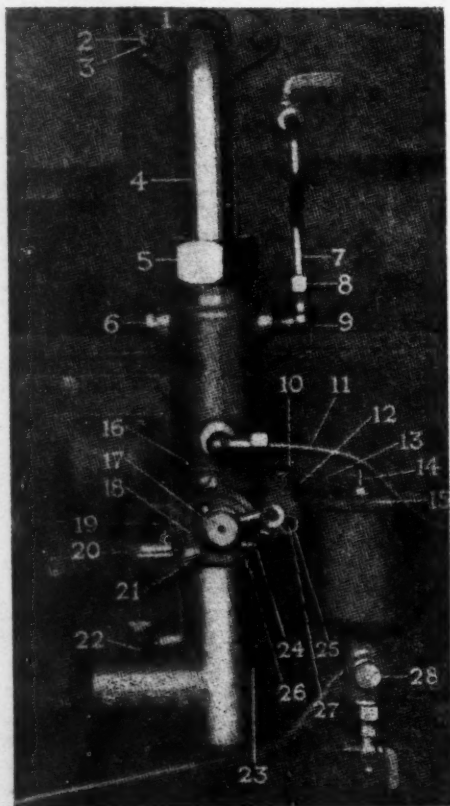


Fig. 8—Showing the carburetor used on the white T.B.C. 2-ton truck

would be well to see if the hub brake shoe and connections are in proper order so that the brake will act sufficiently to prevent the car from creeping ahead.

SPEEDOMETER GEAR RATIOS

Q—What size road gear and pinion is required for a Stewart speedometer with 33x5 and 35x5 cord tires, and what size pinion is required when the road gear has 68 teeth and 35 by 5 cord tires are used?—Twin Oaks Garage, St. Paul, Minn.

The ratio of gears for the Stewart speedometer is found by doubling the diameter of the tire when driven from the front wheel which gives the number of teeth necessary in the road gear. All Stewart speedometer pinions have the same number where front wheel drive is used. The reduction through the swivel joint is $2\frac{1}{2}$ to 1. If there is 68 teeth in the road gear and 35x5 tires are used the standard pinion which has 16 teeth will have to be used. The reading therefore will not be absolutely correct but the difference is hardly worth calculating for.

THREADS

Q—What is the difference in an A. L. A. M. and S. A. E. thread?

2—What is meant by draw filing and why is that method used?

3—Why are both right and left threads

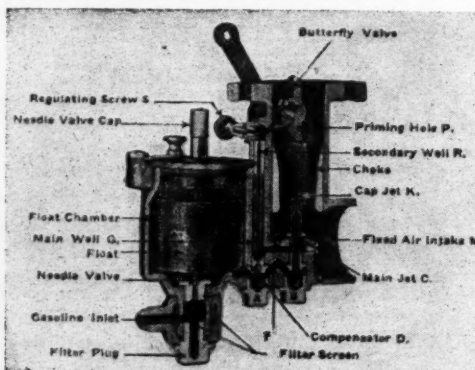


Fig. 9—Zenith carburetor used on the 1916 Chevrolet Baby Grand

used and what is the proper use of the different threads?—T. J. H., Roanoke, Va.

1—No difference.

2—Draw filing is rather hard to explain but Fig. 7 illustrates the method. It is accomplished by holding the file at both ends and working it back and forth across the work. This is usually done to reduce the high part of the work.

3—In general threads are chosen for their particular usage because of the locking principle. If a left-hand thread is used where the motion is in a right-hand direction the tendency is to tighten rather than loosen as a result of this direction of motion. The same effect is created when a right-hand thread is used with a left-hand motion. For instance take the hub cap of a wheel. If you were to place a cap with a right-hand thread on the right-hand wheel, what would happen when the wheel was put into motion? The motion of the wheel would loosen the cap. By using a left-hand thread the wheel will act against the direction of motion of the hub cap when screwing it on and a locking action results.

TIRE SIZE EFFECT

Q—Does the using of two different sizes of tires on rear wheels, for instance, one regular size and one oversize, affect the differential or any other parts?

2—What should compression gage show on a 1917 Studebaker 4 when turning engine over with crank?—Frank Miller, Dayton, Ohio.

1—By using an oversized tire it means that one tire will be one inch larger in diameter than the other, and consequently the smaller will have to make more revolutions per mile than the larger one. The car will be thrown out of balance and undue stresses will be placed on the differential. The differential is in a certain degree a weak part of an automotive vehicle and no great unbalanced strains should be placed upon it. Doing this will not only wear out the differential in time, but will have a direct effect on the suspension of the car because one side will be lower than the other.

2—About 70 lbs.

TACHOMETER

Q—Explain how I might use a magnetic type Stewart speedometer as a tachometer so as to register crankshaft revolutions per minute. I want the clock to read 200 r.p.m. at 2 m.p.h., and at 500 r.p.m. at 5 m.p.h., etc. Show universal joint and give gear ratio.—Arch F. Alspach, Hudson-Alspach & Co., Convoy, O.

The best method would be to make a calculation and then recalibrate the scale. For instance assume a car speed of 5 m.p.h., 4.5 gear ratio and 32 in. wheels. The formula is, engine r.p.m. m.p.h. x gear ratio

equals $337x$ wheel diameter which in the above assumed case gives 237 r.p.m. A new scale can be made and placed either above the present scale or over it. It is also possible to get a direct reading by changing the present gear ratio of the speedometer drive. We cannot give the gear ratio as we do not know what gears are now used on your car.

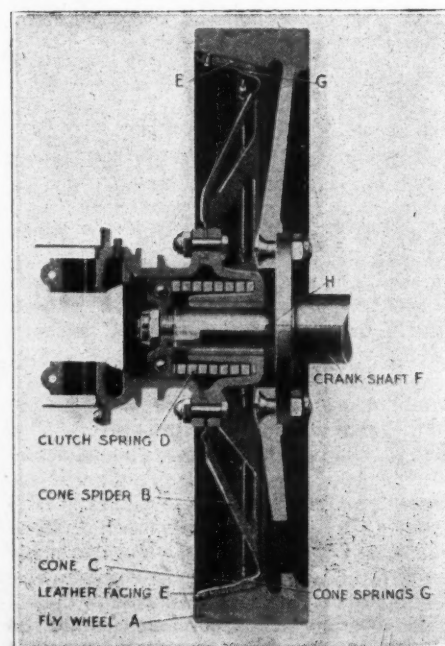


Fig. 10—1913 Studebaker clutch showing bearings

OVERLAND CLUTCH

Q—Could a double universal joint of the Thermoid or Flexite type be installed on an Overland Model 83 to eliminate lost motion of the universal joint?

2—Give adjustment of clutch.—W. S. Robinson, Minneapolis, Minn.

1—Because of the inclosed torque tube construction on this model the double flexible disk joint cannot very well be used.

2—When after considerable running, the clutch begins to "grab" this is usually due to the drying out or hardening of the clutch leather. A dressing of the lining with neatsfoot oil or castor oil, to soften it, will restore its easy and full engagement. The clutch may also grab because the rivets have become flush through the wearing down of the leather. Renewal of the rivets is a remedy in this case.

The clutch may be tightened by screwing the three adjusting nuts down on their studs. Care must be taken, however, to tighten one nut just as much as the others.

If the clutch is too tight, it will "drag" and burn the leather; it should be just tight enough to hold under the maximum load and yet release fully and gradually.

STUDEBAKER UNIVERSAL JOINT

Q—Is there a bearing between clutch and universal joint under clutch shift collar on a 1913 Studebaker model 25? If so, what is it a roller or babbitt bearings?

2—Is there any adjustment to take the play out of pinion and ring gear? Illustrate how this can be done.—O. E. Speer, Marion, Ind.

1—Yes there is a bearing at this place and it is ball bearing. The illustration in Fig. 10 shows the construction.

2—The adjustment provided for the wear in the rear axle is clearly shown in Fig. 10. The collar at the front of the pinion gear can be turned by inserting a screwdriver in the opening made by removing the plate over this adjustment collar. The screw P with its lock washer must first be loosened before any adjustment is attempted. Be sure that when the adjustment is completed this screw and its lock nut is made tight.

Carburetion

ZENITH CARBURETER

Q—The engine of a 1916 Chevrolet Baby Grand vibrates very badly when the car is driven at a speed of 25 miles an hour or more. The engine is timed correctly, but there is doubt as to whether the carbureter is working properly. The carbureter used is a Zenith and is kept in the best shape possible, with the one outside adjustment, but the high and low speed regulations have not been tampered with. At present the car runs from about 8 to 40 m.p.h. an hour on high.—J. C. Craff, Chicago, Ill.

To properly adjust this carbureter, have the engine warm, the spark should be retarded and the dash control down. The low speed adjustment should be turned to the right or left as required until the engine runs properly at low speed. Then when the engine is thor-

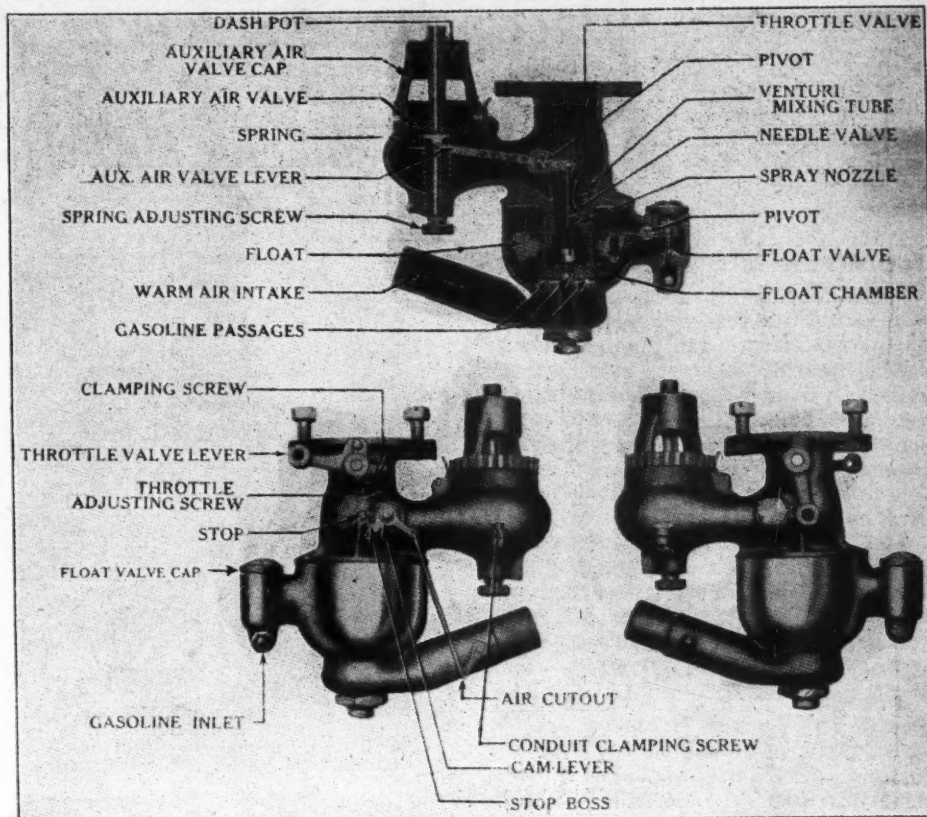


Fig. 11—Schebler carbureter used on the 1917 Studebaker

oughly heated make final adjustment by turning low speed screw to the left until the engine slows down; then turn to the right a notch at a time until the engine idles smoothly. If the engine does not throttle low enough, turn stop arm, Screw "A," Fig. 9, to the left until it runs at the lowest number of revolutions desired.

The high and intermediate speed adjustment is made accessible by removing the hot air elbow from over the main air valve. Do not move the high speed screw more than one-eighth turn at a time. Turn to the right for a richer and to the left for a leaner mixture. This setting, being very effective, will greatly determine the fuel economy; therefore, make sure it is set as lean as possible, still retaining good acceleration.

WHITE TRUCK CARBURETER

Q—Publish diagram of the White carbureter used on White two-ton truck No. T. B. C. 61523.—A. W. Turpin, Molson, Wash.

This is shown in Fig. 8.

SCHEBLER ADJUSTMENT

Q—Give carbureter adjustments used on 1917 Studebaker Four equipped with a model R Schebler carbureter.

2—Give adjustments of carbureter to give greatest speed. What mileage can be obtained with this carbureter? What carbureter would give better results in speed than the Schebler?—Frank Miller, Dayton, Ohio.

1—To adjust this carbureter see that the engine is thoroughly heated and fully retard spark and throttle. Turn the auxiliary valve cap, Fig. 11, to the right or as far down as possible. Now turn

the high speed or auxiliary air valve spring adjusting nut to the right or as far as it will go.

With the two adjustments in this position, pull the dash control out as far as it will go, and start the engine. When the engine is started, gradually return dash adjustment to running position. Dash adjustment must be in this position before proceeding with final adjustment of carbureter. Now turn the auxiliary air valve cap or gasoline adjustment to the left one notch at a time until the engine starts to miss for the want of gasoline. This will ordinarily require approximately one-half turn of this adjusting nut. Then turn it back or to the right one notch at a time until the engine hits perfectly on all cylinders. This will give the correct low throttle adjustment.

Leaving the spark retarded, turn the auxiliary air valve spring adjusting nut to the left or down by half turns until the engine misses for want of fuel. This is an indication that the air valve is off its seat, and lower adjusting nut should be turned to the right until the valve seats, which will be indicated by the engine firing perfectly on all cylinders.

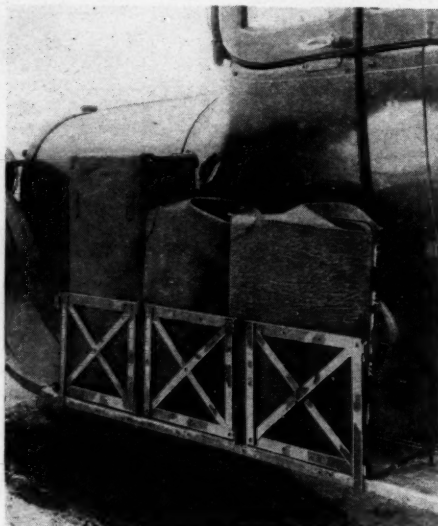
2—The adjustment given should give proper carburetion for maximum speed. When properly adjusted, this carbureter should give about 16 to 18 miles per gallon. Unless you intend to use this car for track work, we do not see why any of the carbureters will not give you all the speed you can ever use. There are several racing carbureters advertised and you can make a choice if high speed is desired.

The Accessory Corner

New Fitments for the Car

Kompak Luggage Carrier

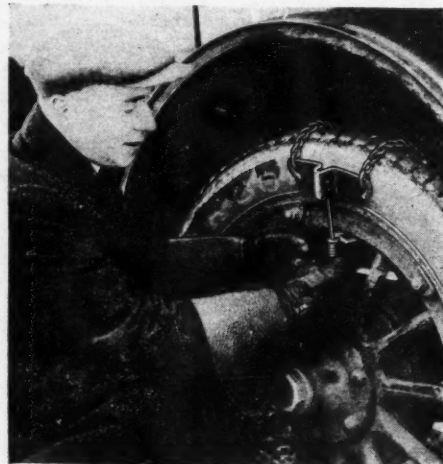
When touring season comes there is always a certain amount of luggage to be carried even though the trip may be short. Touring cars as a rule have not sufficient room to carry extra luggage without sacrificing comfort of the passengers. The carrier shown will fit any running board, and when not needed folds flat and can be carried under the seat cushions or elsewhere very conveniently. It is of simple construction and easily attached. The Bersted Mfg. Co., 765-771 Mather St., Chicago, list a single carrier at \$4.50.



Kompak luggage carrier for holding luggage securely on the running board

Syde-Gripper

The Syde-Gripper is a very handy device to give traction in case of mud or snow. It is of simple construction and easily attached as shown in the illustration. Often times the driver is in a position where putting chains on is a very hard and dirty job. The Syde-Gripper gives a side traction to the tire and can be placed on the wheel without difficulty under any circumstances. These hooks are listed at \$4.50 per pair by the Bersted Mfg. Co., 765-771 Mather St., Chicago.



The Syde-Gripper attached to the tire to give traction in mud

parts coming in contact with water are of brass and the flexibility of the core construction gives ample expansion, which it is claimed will allow core to thaw if frozen, without strain or breakage.

Peerless Radiator

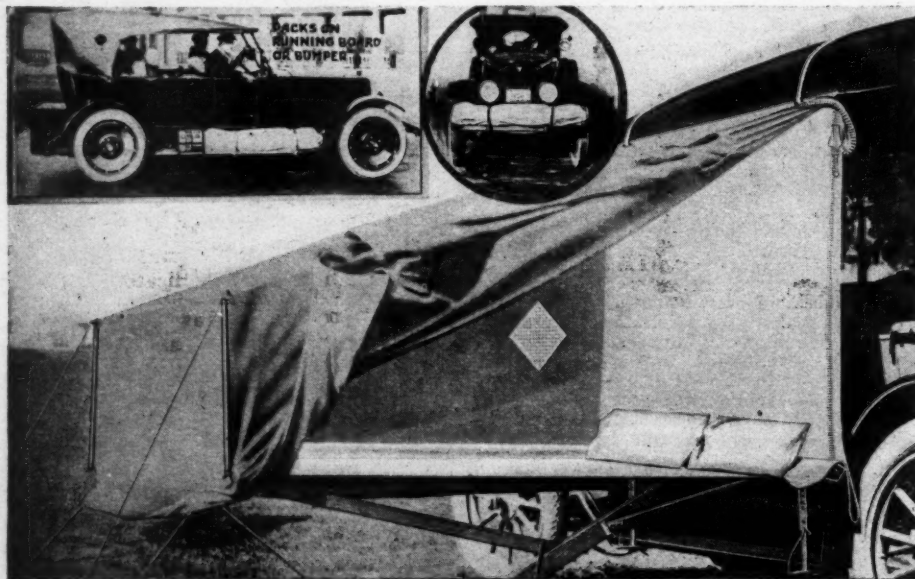
The Corcoran Mfg. Co. of Cincinnati, are manufacturing a radiator for present Chevrolet models. This radiator is equipped with the Peerless honeycomb core. A new feature of the mounting of the angle brackets on spring steel side frames. It is claimed they will absorb the severest road shocks, thereby preventing damage to the radiator. All



Peerless honeycomb radiator being made for the Chevrolet. A feature of this radiator is the shock absorbing method of mounting

Automobile Bed Camps

If a motorist is going to make a fishing or hunting trip he in all probability will be so located that hotel accommodations are not available, and perhaps he desires to get away from the really formal side of life and rough it a bit. It will be necessary to carry a certain amount of equipment, and a device which will give good sleeping accommodations that can be easily packed away when not in use is very desirable. Such a device is shown in the illustration and is known as the automobile bed camp. It be set up independently or attached to the car as shown. A. B. C. Mfg. Co., Kansas City, Mo.



Bed for attaching to the side of car when camping out



The Pennypacker Top Converter

The Pennypacker top converter recently put on the market by the Pennypacker Mfg. Co., Chicago, is built to eliminate front bows and tension straps of the standard Ford top and converts it into a one-man top that can easily be put up or down by one person from the inside of the car. It utilizes the cover material of the old top, stretching the fabric snugly over the frame work.

Service Equipment

Time Savers of the Shop

Universal Valve Refacer

A very interesting refacing tool which not only refaces worn valves in the quickest possible time, but will also save time in valve grinding is being distributed exclusively by the Fairbanks Co., New York. This tool is known as the Universal valve refacer and a valve may be placed in the refacer or taken out, without the use of tools, in five seconds. This tool will reface any valve made, of any degree of hardness and any size. It will take valve stems from $\frac{1}{4}$ in. to $\frac{1}{2}$ in. and heads from 1 in. to $3\frac{1}{2}$ in. in diameter. The V channel type bearings, anchored to the center, will hold any valve made, including motorcycle valve stems which are smaller at the bottom than at the top. A valve can be refaced in two minutes with the Universal valve refacer. It is this feature that permits using the refacer for roughing out badly pitted valves before grinding. Thus saving from one to two hours' time in grinding. This tool is manufactured by the Universal Equipment & Supply Co. and is packed complete with a four edge cutting tool giving 6 in. of cutting surface and is priced at \$7.50.



Universal valve refacer will reface any valve size of any degree of hardness

Wrecking Truck

Every service station is constantly in need of a good wrecking truck. The truck shown in operation in the illustration has 3-in. solid rubber tires, 16-in. in diameter. It is built of cast steel throughout and the wheels are equipped with Hyatt roller bearings which revolve $1\frac{1}{2}$ in. chrome nickel steel axle. The roller bearings being encased in a dust-proof housing. The axle does not revolve, it is large and heavy, being permanently fastened to the frame of

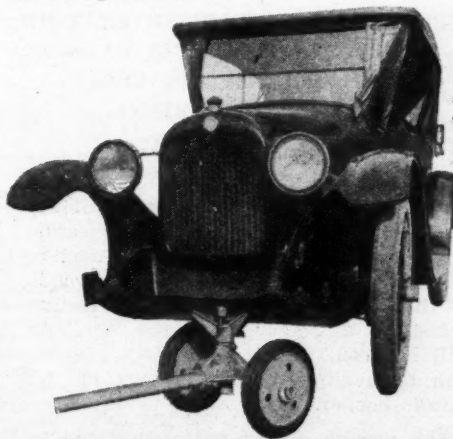


Beardsley valve lifter makes removing valves simple

the truck giving additional strength and rigidity. Another important detail is the long bearing in the frame that supports the saddle post. This overcomes a tendency to keel and prevents smashing the truck when going over extremely rough roads. The saddle post is adjustable and the saddle will fit any part of the front or rear axle. A clamp is furnished for clamping securely to the front axle and the spider shape of the saddle with its supporting arms makes a perfect support for the differential of the rear axle. It is a product of the Continental Shop Equipment Co., Columbus, Ind.

Motor Driven Valve Grinder

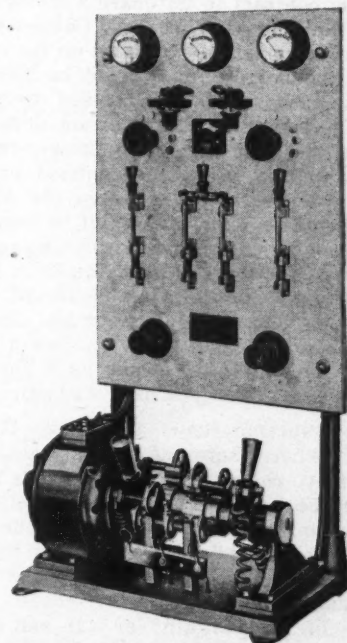
The new motor driven valve grinder described in the April 15 issue of *MOTOR AGE* is manufactured by D. F. Dunham & Co., Los Angeles, Cal., and not by the Westinghouse Electric Mfg. Co., as stated at that time. C. N. and F. W. Jonas, Los Angeles, Cal., are the manufacturers' representatives and have exclusive sale of this product.



Continental wrecking truck for towing in disabled cars. The wheels are equipped with roller bearings

Advance Motor Rectifier

The Advance motor rectifier is a compact, well designed battery charging outfit that can be used to advantage in many service stations. It consists of an $\frac{1}{8}$ hp. motor with an extended shaft, upon which is mounted three collector rings and two special commutators which absorb the alternating current from a transformer, as a three wire circuit, and converts the alternating current into direct current to two separately controlled circuits, in graduated voltages of 22-volt steps to 100 volts and normal capacity of 1 kw. The total direct current output is 2 kw. It is claimed that 6-volt batteries can be charged at approximately 4 cents each on full load. This rectifier is manufactured by the Advance Electric Co., 131 East 6th St., Los Angeles.



Advance motor rectifier for charging batteries

Beardsley Valve Lifter

In the overhauling of internal combustion engines there has always been the disagreeable job to contend with of taking out and putting in the valves, for if the engine runs properly the valves must be cleaned and resealed. The Ford lifter being applied as shown in the illustration, shows how simple and positive the operation is without danger to the operator's hands; also lifts the valve spring and the valve stems in the engine block in any position, making it unnecessary to seat valves before lifting. Price \$1.00. Made by the Loomis-Beardsley Co., Columbus, O.

Law in Your Business



By Wellington Gustin



What Are Remedies of Seller on Buyer's Breach?

SELLING TO ANOTHER ON BUYER'S BREACH WAIVES RIGHT TO STAND ON CONTRACT WITH BUYER

The remedies of a dealer on a sales contract where the buyer has failed to perform has been well stated in a case just decided by the Supreme Court of Wisconsin. Here a customer made a written contract to purchase a motor car from the John G. Wollaeger Company of Milwaukee, paying \$200 down on the contract, the balance to be paid in installments. This customer refused to perform according to this contract and the dealer later sold the car to another for a figure slightly below the contract price. The dealer refused to return the \$200, and the customer brought suit to recover the amount. The lower court awarded judgment for the return of the \$200, less the dealer's loss on the resale of the car, and from this judgment the dealer appealed, contending he was not given proper amount of damages as a set off on the \$200. The judgment was affirmed.

The Supreme Court laid down these rules. Where there has been a breach of a contract covering a sale of goods and where the goods remain in the seller's possession, he may follow any one of these three remedies: (1) Hold the property for the buyer and sue him for the purchase price, and thus secure the profits of his bargain; or (2) sell the property as agent for the buyer and recover the difference between contract price and a fair market value upon resale as the liquidated amount of the damage; or (3) keep the goods and recover the difference between the contract price and fair market value. These remedies are common to the states having the Uniform Sales law. The dealer contended that under this rule of damage he is not made good the loss of profits he suffered as a result of the customer's refusal to perform the contract. But the court said it must be borne in mind that the cost of the car to the dealer was the same whether he sold it to the customer or to the other party, and the jury allowed the dealer the difference between the contract price and the price received from the other sold to. Furthermore it

SEEMINGLY knotty legal problems are constantly arising in the dealer's business, which even a slight knowledge of the law easily may solve. MOTOR AGE presents here the most common legal problems which confront the dealer. Mr. Gustin, a member of the Chicago bar, not only is well versed in the law relating to the dealer but presents it in such a way as to be readily understood by the layman. In addition to his articles, Mr. Gustin will gladly answer such individual inquiries on knotty points as may be submitted him.

was said that if the dealer desired to collect the profits on its sale to its customer, the law offers the opportunity for him to hold the car for its customer and sue him for the purchase price, thus recovering the profits of the bargain. When the dealer sold the car to another, as he did, he elected to waive the right to stand on its bargain and accept as the measure of his damage for the breach of contract by the customer the difference between the price of the car the customer agreed to pay and the price for which he sold the car to that other.

What Is the Responsibility of Garage Keepers for Stolen Cars?

KEEPER MUST ESTABLISH THAT HE IS NOT NEGLIGENT IN CAUSING LOSS TO HIS CUSTOMER—THE MINNESOTA DECISION

Where an automobile is stolen from a public garage, what is the responsibility of the garage keeper? This question was presented to the Supreme Court of Minnesota in a recent case, which, also is the case referred to in a question asked by a reader of MOTOR AGE. As will be seen, this is ultimately a question of negligence on the part of the garage keeper.

The garage owner operated a public garage in Minneapolis. The customer kept his car there upon an agreed

monthly compensation. On Saturday the customer calls for his car, but it was not to be found in the garage and could not be produced. He had used it but a week previous. It was conceded that the car was stolen, since it could not be accounted for otherwise. The customer sued to recover the value of the car. Judgment was given him against the garage keeper.

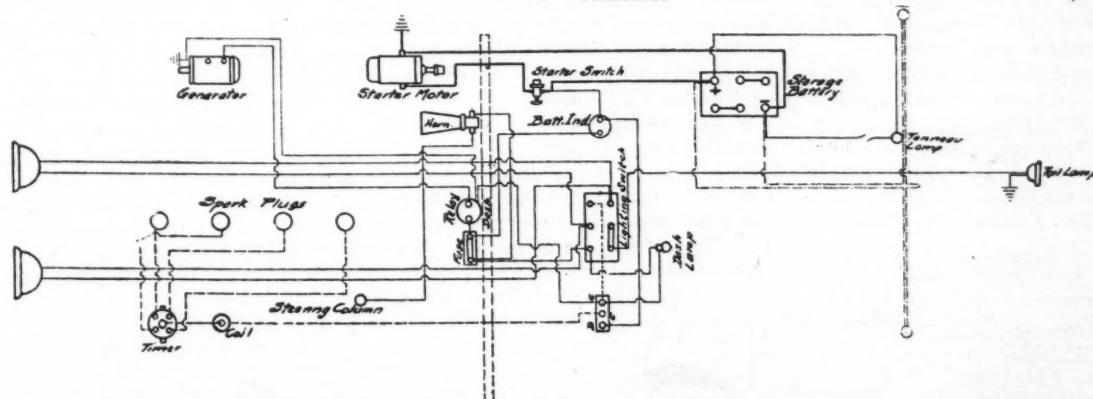
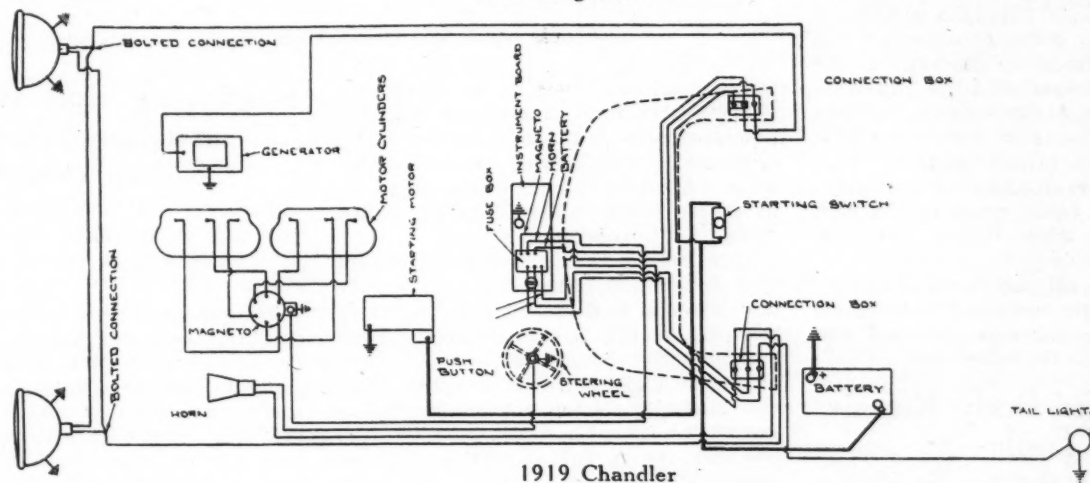
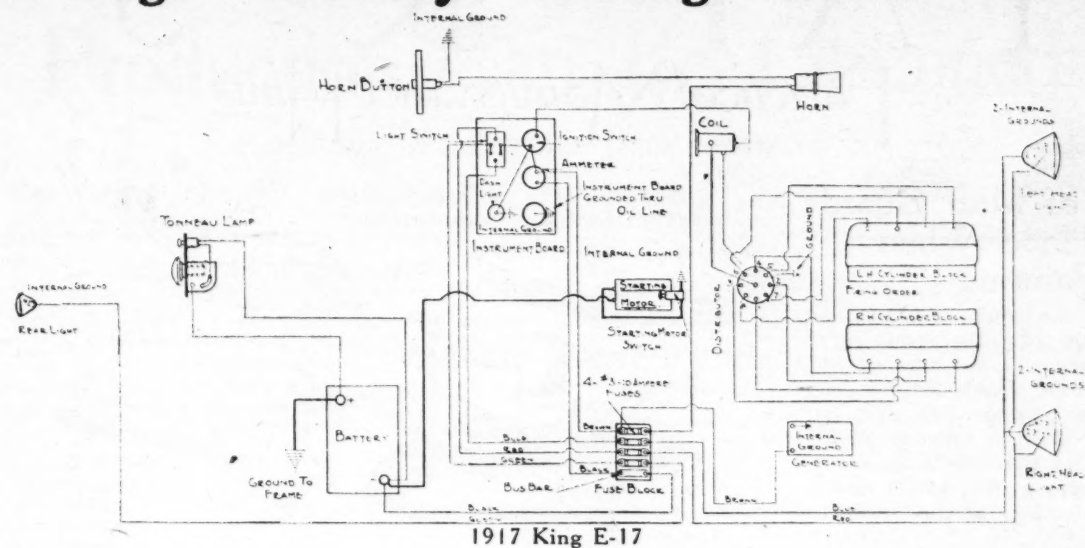
The Supreme Court held the rule to be that it devolved upon a garage keeper who had received an automobile for repair and could not return it, to prove that he exercised the required care to keep it safely. And the burden of proof is upon the garage keeper to show that loss of the car did not come from his negligence. This burden is that requirement of establishing before the jury that his negligence did not cause the loss.

The principle of the rule applies to the situation here. The customer entrusted his car to the garage keeper for storage, taking out and using it as he chose. It was lost from the keeper's possession. The customer knew nothing and could know nothing of the circumstances of its disappearance. The garage keeper was paid for furnishing storage which carried with it the duty of giving some measure of care. He had men in charge of the garage giving attention to his customers and their property. It was, or should have been in possession of such circumstances as could be disclosed relative to the loss.

The evidence was only this, that the garage keeper could give no explanation of how the car got out of the garage. The jury, taking into consideration the manner in which the garage was conducted, could find that if proper care had been used, as the situation required, it would not have disappeared.

The garage keeper offered to prove that he had posted in his garage two signs reading: "Not responsible for cars stolen or damaged by fire, wind or water." But the court excluded this evidence attempting to limit the keeper's liability, since it was not shown that the customer saw the signs and his attention was not called to them, and therefore, there could be no assent on the customer's part to the limitation of the garage keeper's responsibility, granting that the latter may so limit it. Judgment against the garage keeper for the value of the car was affirmed.

Motor Age Weekly Wiring Chart No. 78



THIS WEEK

1917 King E-17

1919 Chandler

1917-18-19 Moline-Knight

Allen—Dec. 18, '19
 Auburn—Nov. 27, '19; April 1, '20
 Briscoe—May 6, '20
 Cadillac—April 22, '20
 Chalmers—Nov. 27, '19
 Crow-Elkhart—April 22, '20
 Cutting—Nov. 6, '19
 Daniels—Dec. 4, '19
 Davis—Dec. 4, '19
 Dixie—April 1, '20
 Dodge—April 15, '20
 Dorris—Dec. 11, '19
 Dort—March 25, '20
 Elcar—May 6, '20

Essex—May 15-22, '19
 Franklin—Dec. 11, '19
 General Battery Charging—Sept. 25, '19
 General Magneto Diagram—June 5, '19
 Grant—April 29, '20
 Internal Connections—July 10-17-24, '19
 Jeffery—May 13, '20
 Keeton—Nov. 6, '19
 Lexington—Jan. 1, '20
 Liberty—Jan. 1, '20
 Marmon—Dec. 25, '19; Jan. 22, '20
 Mercer—Nov. 27, '19; March 25, '20
 Mitchell—Jan. 8, '20
 Moon—Jan. 29, '20; March 11, '20
 Moore—March 4, '20
 Nash—March 11, '20
 National—Feb. 12, '20
 Oakland—April 15, '20
 Oldsmobile—April 8, '20
 Olympian—Jan. 22, '20

Packard—March 18, '20
 Paige—July 3, '19; April 20, '20
 Peerless—May 13, '20
 Pierce-Arrow—Feb. 5, '20
 Pilot—March 4, '20
 Premier—Dec. 18, '19; Feb. 26, '20
 Reo—Nov. 13, '19
 Roamer—March 18, '20
 Saxon—April 8, '20
 Scripps-Booth—Jan. 15, '20
 Stearns-Knight—Jan. 6, '20
 Stephens—Feb. 12, '20
 Studebaker—Dec. 25, '19
 Stutz—Feb. 5, '20
 Templar—Jan. 20, '20
 Velle—Feb. 10, '20
 Westcott—Jan. 15, '20
 White—Feb. 10, '20
 Willys-Knight—Feb. 26, '20
 Special Systems for Fords—May 15-22, '19

The Automotive Repair Shop

Practical Maintenance Hints

Removal of Mud Guards and Hood When Painting

To facilitate the work of varnishing or repainting the car, disassembling to the extent of removing the mud guards, engine hood and the wheels will not only result in saving considerable time but also permits of a better finished job.

Before removing the wheels the car is jacked up at least a foot, which makes the body a comfortable height for working upon.

With the wheels and mud guards off the painter has nothing to hinder him from working freely on the sides of the body. The parts removed are either set up or suspended edgewise, after painting and varnishing so as to present the least surface to catch falling dust.

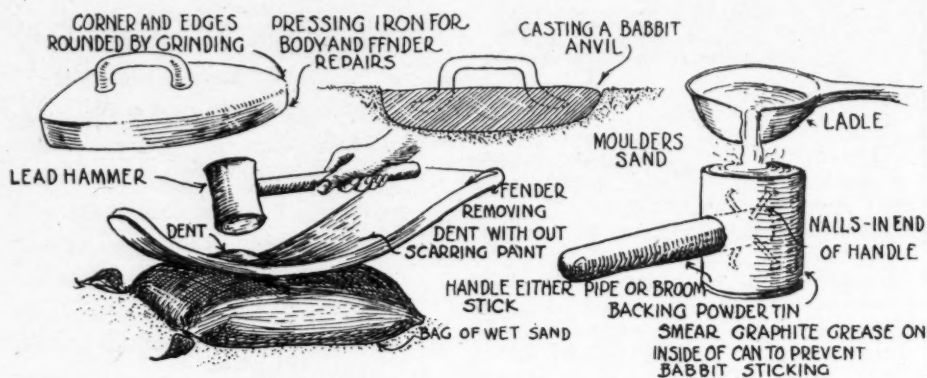
Tilting the lower glass of the windshield forward keeps much of the dust from the cowl, while this is wet with varnish.

Not only are all the surfaces of the body exposed for working upon them but the work is far less awkward and the job is done in the least time.

Fender and Body Repair Tools

Three tools are shown in the illustration that are of service in restoring bent and buckled fenders and bodies.

The first is an ordinary tailor's pressing iron with the corners and edges rounded off on the grindstone. For heavy work, as straightening beads on fenders and attaching riveted on patches, this tool is both a serviceable and inexpensive hand anvil. Putting in rivets or



Tools which will facilitate fender and body repairs

tightening loose rivets in the frame, etc.

The second tool is patterned after the pressing iron, but has a babbitt metal face and in consequence should be used when the fender or body dents are slight, or where these injuries are not much more than bulges.

This tool is made from a piece of pipe flattened at either end, as a handle. A depression is made in moulding sand, the pipe placed in the depression and molten babbitt poured in.

The third tool is a lead or babbitt hammer made by placing a piece of pipe or broom handle with some nails through one end, into a baking powder tin and pouring the molten metal in. The nails secure the lead firmly to the handle. The inside of the tin mould should be smeared with graphite grease to prevent the can sticking to the hammer.

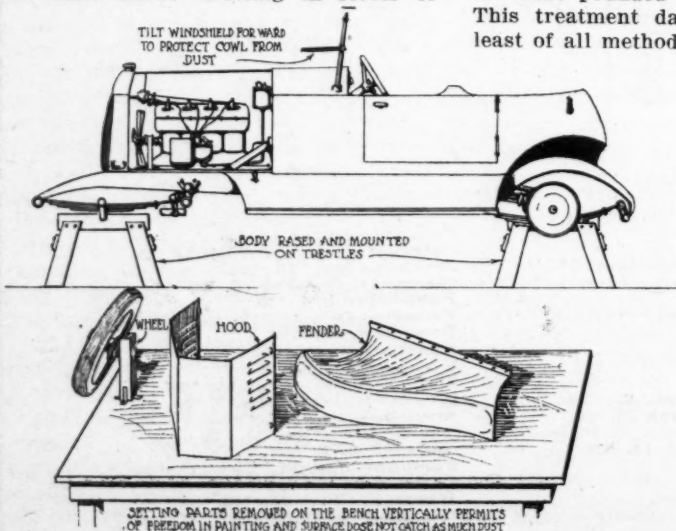
A bag of wet sand is an aid also to straightening fenders, lamps, etc., parts that can be removed from the car. The wet sand bag is laid on the floor and the dent pounded from the under side. This treatment damages the paint the least of all methods.

Removing and Replacing Bushings Simultaneously

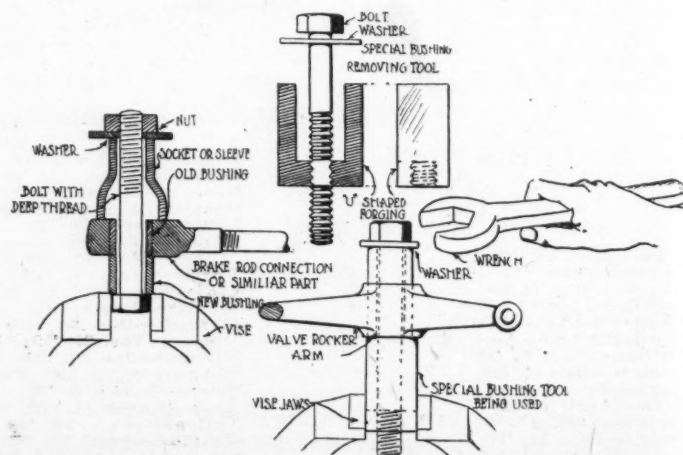
To remove a bushing and put in the new part in the same operation results in a considerable saving of the workman's time.

The simplest tools for this work are: One long bolt, nut, washer and a sleeve or similar part as a socket used with separate handle. The bolt is gripped in the vise and the new bushing placed over the bolt. The part with the bushing is then put on, sleeve or socket put over with the washer on top. Screwing down the nut forces the new bushing in place and the old one out.

A special tool that will be found exceptionally rapid and is used similarly to the above procedure is a "U" shape forging with a threaded hole at the bottom. This is used with a long bolt and a washer. If the supports are too wide a heavy washer is inserted under the part, having the bushing removed. This tool is clamped in the vise when used.



A better and quicker job of painting can be done by removing the mud guards, hood and wheels



Saving time by removing and replacing bushings simultaneously

Where Parts for Old Models of Cars In Production Can Be Obtained

Motor Age Maintenance Data Sheet No. 97

One of a series of weekly pages of information valuable to service men and dealers—save this page

Allen

Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Auto Salvage Co., Tulsa, Okla.
I. Wolf Auto Parts & Tire Co., 619 N. Illinois St., Indianapolis.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.

American

Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Auto Parts Co., 4116-18 Olive St., St. Louis.
I. Wolf Auto Parts & Tire Co., 619 N. Illinois St., Indianapolis.
Standard Motor Parts Co., New Castle, Ind.

Anderson

Auto Salvage Co., Tulsa, Okla.

Apperson

Auto Gear Co., 844 Eighth Ave., New York.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Wycoff Auto Service Co., Sioux City, Ia.

Atterbury

Auto Gear Co., 844 Eighth Ave., New York.
Hartford Motor Car Co., Hartford, Conn.

Auburn

Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Auto Salvage Co., Tulsa, Okla.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
The Boneyard, Washington, Ia.

Auto Car

I. Wolf Auto Parts & Tire Co., 619 N. Illinois St., Indianapolis.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Baker Electric

Paul A. Frank Co., 2349 Michigan Ave., Chicago.

Bessemer

Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.

Buick

Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
The Boneyard, Washington, Ia.

Bour-Davis

Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.

Cadillac

Auto Gear Co., 844 Eighth Ave., New York.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.

Case

Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.

Chalmers

Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
The Boneyard, Washington, Ia.

Chandler

Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.

Chevrolet

Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
The Boneyard, Washington, Ia.

Cole

Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
The Boneyard, Washington, Ia.

Crawford

Wichita Auto Wrecking Co., 801 W. Douglas Ave., Wichita.

Crow-Elkhart

Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Crow-Elkhart Co., Elkhart, Ind.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.

Dart

Auto Salvage Co., 1701-03 Main St., Kansas City.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Davis

Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Auto Salvage Co., Tulsa, Okla.
Dayton Auto Parts Co., 351 W. 52nd St., New York.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.

Dixie Flyer

Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.

Dorris

Auto Gear Co., 844 Eighth Ave., New York.

Dort

Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Levene Motor Co., Philadelphia.

Dupont

Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.

Elear

Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Elkhart Carriage & Motor Co., Elyria, O.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
Waukesha Motor Co., Waukesha, Wis.

Elgin

Auto Gear Co., 1404 Hennepin Ave., Minneapolis.

Fageol

Fageol Motor Car Co., 226 N. Los Angeles St., Los Angeles.

Ford

Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Auto Parts & Repair Co., Springfield, Mass.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.

Grant

Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Levene Motor Co., Philadelphia.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.

Where Parts Can Be Obtained for Orphan Passenger Cars and Trucks

Thomas-Detroit

Auto Gear Co., 844 Eighth Ave., New York.
Johns Auto Machine Co., W. H., 908 W. Pico St., Los Angeles.
Wolf Auto Parts & Tire Co., I., 619 N. Illinois St., Indianapolis.

Toledo

Dayton Auto Parts Co., 1777 Broadway, New York.

Vim

Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.

Warren

Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291 Marietta St., Atlanta.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Davis, Carey A., 486 Louisiana Ave., Washington, D. C.
Dayton Auto Parts Co., 1777 Broadway, New York.
Gorey & Co., Jos. C., 354 W. 50th St., New York.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Wichita Auto Wrecking Co., 801 W. Douglas Ave., Wichita.

Waverly Electric

Longaker Co., V. A., 448-50 N. Capitol Ave., Indianapolis.

Wayne

Auto Salvage Co., 1701-03 Main St., Kansas City.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Welch-Detroit

Auto Salvage & Exchange, 1317 Locust St., Des Moines.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Welch-Pontiac

Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Wichita

Auto Gear Co., 844 Eighth Ave., New York.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.

Woods Electric

Majestic Motors Corp., 2515 Calumet Ave., Chicago.

Woods Mobilette

Auto Auction Co., 519 W. Jackson Blvd., Chicago.

Yale

Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Emerson

Winfield Barnes Co., Pittsburgh.
Batauf Motor Car Co., Port Jefferson, L. I.
Apollo Magneto Corp., Kingston, N. Y.
Puritan Machine Co., Detroit.

Specifications of the Electrical Equipment Found on 1920 Passenger Cars

Make and Model	IGNITION			GENERATOR		MOTOR		BATTERY			Wiring System	Units Combined	FUSES		
	System	Make	Control	Make	Voltage	Make	Voltage	Make	Amp. Hr.	Voltage			Type	Volts	Amp.
Allen.....43	Single	Conn.	Hand.	A-L.	6	A-L.	6	Prest-O-L.	80	6	1	GI.	GT.	6	15
American.....B	Single	Conn.	Hand.	West.	6	Remy.	6	Willard.	90	6	1	S.	3-A.	1,250	20
Anderson.....All	Single	Remy.	Hand.	Remy.	6	Remy.	6	Willard.	90	6	1	S.	Open.	1,250	10
Apperson.....All	Single	Remy.	Hand.	Bijur.	6	Bijur.	6-8	Willard.	108	6	1	S.		12	20
Argonne.....4		Eisemann.	Hand.	West.	12	West.	12	Exide.	100	12	1	S.		6-8	25
Auburn.....6-39	Single	Remy.	Hand.	Remy.	6	Remy.	6	Willard.	80	6	1	S.			
Beggs.....20-T		Conn.	Hand.	A-L.	6	A-L.	6	Exide.	80	6	1	GT.	Cart.	6	15
Biddle.....B-1 & B-5	Single	Simms.	Hand.	G & D.	6	G & D.	6	Willard.	90	6	1	S.	GT.	6	10
Bour-Davis.....21	Single	West.	Hand.	West.	6	West.	6	Willard.	125	6	1	S.	GT.	6	15
Brewster.....	Single	Berling.	Hand.	U. S. L.	12	U. S. L.	12				1				
Briscoe.....4-34	Single	Conn.	Hand.	A-L.	6	A-L.	6	Prest-O-L.	80	6	1	GI.	GT.	6	20
Buick.....	Single	Delco.	Hand.	Delco.	6	Delco.	6	Willard.	80	6	1	S.			
Cadillac.....57	Single	Delco.	H. & A.	Delco.	6	Delco.	6	Exide.	130	6	1	GM.			
Case.....V-20	Single	West.	H. & A.	West.	6	West.	6	Willard.	117½	6	1	GI.	5AGT.	50	105
Chalmers.....35-C	Single		Hand.		6		6		106	6	1	GI.	GT.	6	15-30
Champion.....KO	Single	Delco.	Hand.	Dyneto.	6	Dyneto.	6	Willard.	90	6	1	S.	GT.	6	200
Chandler.....All	Single	Bosch.	Hand.	G & D.	6	G & D.	6	Prest-O-L.	105	6	1	S.	GT.	6	
Chevrolet.....All	Single	Remy.	Hand.	A-L.	6	A-L.	6	Willard.	80	6	1	GI.	GT.	6	
Cleveland.....40	Single	G & D.	Hand.	G & D.	6	G & D.	6	Prest-O-L.	94	6	1	S.	GT.	6	
Cole.....All	Single	Delco.	H & A.	Delco.	6	Delco.	6	Prest-O-L.	50	6	1	S.			
Columbia.....All	Single	At-Kent.	Hand.	A-L.	6	A-L.	6	Prest-O-L.	80	6	1	S.			
Comet.....C-53	Single	Wagner.	Hand.	Wagner.	6	Wagner.	6	Willard.	75	6	1				
Commonwealth.....4-40	Single	At-Kent.	Hand.	Dyneto.	6	Dyneto.	6	Prest-O-L.	105	6	1				
Crow-Elkhart.....L-53	Single	Conn.	Hand.	Dyneto.	6	Dyneto.	6	Exide.	120	6	1		Cart.	6	10
Cunningham.....V-3	Single	Delco.	H & A.	West.	6	West.	6	Willard.	120	6	1				
Daniels.....8-D	Single	Delco.	H & A.	Delco.	6	Delco.	6	Willard.	140	6	1	S.			
Davis.....51	Single	Delco.	Hand.	Delco.	6	Delco.	6	Willard.	80	6	1	S.			
Dixie Flyer.....	Single	Conn.	Hand.	Dyneto.	6	Dyneto.	6	Willard.	6-80		2				
Dodge Brothers.....	Single	Own.	H & A.	N. E.	12	North East	12	Willard.	50	12	1	GM.	Encl.	1-50	10
Dorris.....6-80	Single	Bosch.	Hand.	West.	6	West.	6	Willard.	115	6	1	S.	GT.	5-8	15
Dort.....15	Single	Conn.	Hand.	West.	6	West.	6	U. S. L.	85	6	1	S.		6	10
du Pont.....A	Single	Eisemann.	H & A.	West.	6	West.	6	Exide.	115	6	1	S.			
Economy.....6-46	Single	Own.	Hand.	A-L.	6	A-L.	6	Willard.	90	6					
Elcar.....All	Single	Delco.	Hand.	Delco.	6	Delco.	6	Willard.	90	6	1	S.	GT.	6-8	20
Elgin.....K	Single	Wagner.	Hand.	Wagner.	6	Wagner.	6	Willard.	90	6	1		GT.	6-8	20
Essex.....A	Single	Delco.	H & A.	Delco.	7	Delco.	6	Exide.	105	6	1	S.			
Ferris.....				L-N.		L-N.									
Ford.....T*	Single	Own.	Hand.	Own.	6	Own.		Opt.	80	6	1	S.			
Franklin.....9-B	Single	At-Kent.	Auto.	Dyneto.	12	Dyneto.		Willard.	60	12	2	GM.	GT.	14	10
Gardner.....O	Single	West.	Hand.	West.	6	West.	6	Willard.	90	6	1	S.	GT.	6	20
Geronimo.....		Delco.		Dyneto.	6	Dyneto.	6	Willard.	88	6	1	S.			
Grant.....H	Single	At-Kent.	Hand.	Bijur.	6	Bijur.	6	Prest-O-L.	105	6	1	S.	2GT.	6-8	15
Hanson.....45-A	Single	Remy.	Hand.	A-L.	6	A-L.	6	Prest-O-L.	80	6	1		Cart.	6	3
Harroun.....	Single	Remy.	Hand.	Remy.	6	Remy.	6	Prest-O-L.	80	6	1				
Harvard.....4-20		At-Kent.		Wagner.	6	Wagner.	6	Nat. Carb.			1	S.			
Hatfield.....A		Conn.		Dyneto.	6	Dyneto.	6	Willard.	100	6	1	GI.			
Haynes.....47	Single	Kingston.	Hand.	Leece-N.	6	Leece-N.	6	Willard.	120	6	1	GI.	GT.	6	5
H. C. S. Special.....		Delco.	Hand.	Delco.		Delco.									
Hollier.....206-B	Single	R & B.	Hand.	West.	12	West.	6	U. S. L.	80	6	1	S.	GT.	6	20
Holmes.....	Single	Eisemann.	Auto.	Dyneto.	12			Willard.	100	12	2	S.	GT.	15	15
Hudson Super-Six.....	Single	Delco.	H & A.	Delco.	7	Delco.	7	Exide.	105	6	1	GM.			
Huffman.....	Single	Conn.	Hand.	Dyneto.	6	Dyneto.	6	Willard.	80	6	1	S.		6	25
Hupmobile.....R	Single	At-Kent.	Hand.	West.	6	West.	6	Willard.	90	6	1	S.	Encl.	6	10
Jackson.....6-38	Single	Remy.	Hand.	A-L.	6	A-L.	6	U. S. L.	94	6	1	GI.	GT.	6-8	15
Jones.....All	Single	Remy.	Hand.	A-L.	6	A-L.	6	Prest-O-L.	120	6	1	GI.	GT.	6	20
Jordan.....F	Single	Delco.	Hand.	Delco.	6	Delco.	6	Willard.	108	6	1	S.	C. B.		
Jordan.....M	Single	Delco.	Hand.	Delco.	6	Delco.	6	Willard.	94	6	1	S.	C. B.		
Kenworthy4-88&6-55	Double	Bosch.	Hand.	West.	6	West.	6	Exide.	140	6	1	S.		6	
King.....8	Single	At-Kent.	Hand.	West.	6	West.	6	Prest-O-L.	120	6	1	S.	Cart.	6	10
Kissel.....	Single	Remy.	Hand.	Remy.	6	Remy.	6	Willard.	117.5	6	1	S.	3 A. G.	6	20
Kline.....6-55-J	Single	Conn.	Hand.	Wagner.	6	Wagner.	6	Prest-O-L.	80	6	1	S.	5 A. G.	6	
LaFayette.....	Single	Delco.	H & A.	Delco.	6	Delco.	6	Exide.	130	6		GM.	C. B.		
Leach.....	Single	Delco.	Hand.	Delco.	6	Delco.	6	Prest-O-L.	180	6	1	S.	Cart.	6	15
Lexington.....S-20	Single	Conn.	Hand.	G & D.	6	G & D.	6	Willard.	100	6	1		GT.	6	15-5
Liberty.....10-C	Single	Wagner.	Hand.	Wagner.	6	Wagner.	6	Willard.	90	6	1	GI.			
Locomobile.....48-6-7	Dual	Berling.	Hand.	West.	6	West.	6	Exide.	150	6	1	S.	G. T.	6	10
Lorraine.....	Single	West.	Hand.	West.	6	West.	6	U. S. L.	94	6	1	S.	GT.		

ABBREVIATIONS: *Starting and Lighting in closed models only. Ignition: At-K, Atwater-Kent; Conn., Connecticut; West, Westinghouse; Auto, Automatic; H. & A., Hand and Automatic; S. A., Semi-Automatic. Generator: A-L, Auto-Lite; G & D, Gray & Davis; Leece-N, Leece-Neville; Ward-L, Ward-Leonard; N. E., North East; Split, Splitdorf. Motor: A-L, Auto-Lite; G & D, Gray & Davis; Leece-N, Leece-Neville; West, Westinghouse.

Giving Ignition, Starting, Lighting, Battery, Lamp, Spark Plug and Horn Data

LAMP CANDLEPOWER, VOLTAGE AND TYPE OF BASE										SPARK PLUGS			Horn	Make and Model	
Amp.	Base Contact	HEADLIGHTS		SIDELIGHTS		TAILLIGHTS		DASHLIGHT		Make	Diam. Inches	Thread Pitch			
		Volts	CP.	Volts	CP.	Volts	CP.	Volts	CP.						
15	Single	6-8	18	*6-8	5	6-8	2	6-8	2	Champion	7/8	18	Klaxon	Allen	43
20	Single	6-8	15	*6-8	5	3-4	2	3-4	2	Bethlehem	7/8	18	Sparton	American	B
10	Single	6-8	17			6-8	2	6-8	2	A. C.	7/8	18	Klaxon	Anderson	All
20	Double	6-8	18	*6-8	4	d6-8	2	d6-8	2	A. C.	7/8	18	Sparton	Apperson	All
25	Single	12	21	12	6	12	2	12	2	A. C.	7/8	18	Klaxon	Argonne	4
	Single	6-8	15	*6-8	4	6-8	2	6-8	2	Rajah	7/8	18	E. A.	Auburn	6-39
15	Single	6-8	21	6-8	4	3-4	2	3-4	2	Champion	7/8	18	Trojan	Beggs	20-T
10	Single	6-8	21	*6-8	4	6-8	2	d6-8	2	Splitdorf	7/8	18	Klaxon	Biddle	B-1 & B-5
15	Single	6-8	15	6-8	5	6-8	2	6-8	2	A. C.	7/8	18	Trojan	Bour-Davis	21
20	Single	12	36	12	4	6-8	2	d6-8	2	Herz-Boug	7/8	18	Klaxon	Brewster	
	Single	6-8	21			6-8	2	d6-8	2	Champion	7/8	18	Sparton	Briscoe	4-34
	Single	6-8	15	6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Stewart	Buick	
105	Single	7	18	8	6	4	2	3-4	2	Titan	7/8	18	Delco	Cadillac	59
15-30	Single	6-8	21	6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Klaxon	Case	V-20
200	Single	6-8	15	6-8	4	6-8	2	6-8	2	Champion	7/8	18	Chalmers		35-C
	Single	6-8	15			6-8	2	6-8	2	Champion	7/8	18	Garford	Champion	KO
	Single	6-8	15	6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Klaxon	Chandler	All
	Single	6-8	21	6-8	4	6-8	2	d6-8	4	A. C.	7/8	18	Klaxon	Chevrolet	All
	Single	6-8	17	6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Trojan	Cleveland	40
	Single	6-8	21	*6-8	5	6-8	4	d6-8	5	A. C.	7/8	18	Sparton	Cole	All
	Single	6-8	15	*6-8	4	6-8	2	d6-8	2	Champion	7/8	18	Schwarze	Columbia	Ali
	Single	6-8	18			6-8	2	6-8	4	Champion	7/8	18	Klaxon	Comet	C-53
	Single	6-8	21	6-8	4	6-8	2	6-8	2	A. C.	7/8	18	E. A. L.	Commonwealth	4-46
10	Single	6-8	15	6-8	4	6-8	2	6-8	2	Champion	7/8	18	E. A. Lab.	Crow-Elkhart	L-55
	Single	6-8	21	6-8	4	6-8	2	6-8	2	Champion	7/8	18	Sparton	Cunningham	V-3
	Single	6-8	21	6-8	4	6-8	2	d6-8	2	A. C.	7/8	18	Klaxon	Daniels	8-D
	Single	6-8	21			6-8	2	6-8	2	A. C.	7/8	18	Klaxon	Davis	51
10	Double	6-8	15			d3-4	2	d3-4	2	Champion	7/8	18	Garford	Dixie Flyer	
15	Single	12-16	15			12-16	2	12-16	2	A. C.	7/8	18	NorthEast	Dodge Brothers	
10	Single	6-8	21	6-8	4	6-8	2	6-8	2	Opt.	7/8	18	Klaxon	Dorris	
	Single	6-8	15			6-8	2	d6-8	2	A. C.	7/8	18	Schwarze	Dort	15
	Single	6-8	21	6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Klaxon	du Pont	A
20	Single	6-8	21	6-8	4	6-8	2	6-8	2	Champion	7/8	18	E. A. L.	Economy	6-46
20	Single	6-8	21			6-8	2	6-8	2	Champion	7/8	18	E. A. L.	Elcar	All
	Single	6-8	15			3-4	2	*3-4	2	A. C.	18 m.m.	1.5 m.m.	Sparton	Elgin	K
														Essex	A
10	Sgl. & Dbl.	6-8	17	6-8	2	6-8	2			Champion	1 1/2	pipe	Own	Ferris	
	Double	12-16	15	*12-16	4	6-8	2	6-8	2	Opt.	7/8	18	Klaxon	Ford	T
20	Single	6-8	15			6-8	2	6-8	2	Champion	7/8	18	Trojan	Franklin	9-B
15	Single	6-8	21			6-8	2	6-8	2	Champion	7/8	18	Trojan	Gardner	G
	Single	6-8	15	6-8	4	6-8	2	6-8	2	Champion	7/8	18	Trojan	Geronimo	
	Single	6-8	15			6-8	2	6-8	2	Champion	7/8	18	Trojan	Grant	H
3	Single	6-8	15			6-8	2	6-8	2	Champion	7/8	18	Schwarze	Hanson	45-A
	Single	6-8	15			3-4	2	d3-4	2	A. C.	7/8	18	Schwarze	Harroun	
	Single	6-8	15	3-4		3-4		*3-4			7/8	18	Harvard	Hatfield	4-20
5	Single	6-8	15	*4-8	4	6-8	4	6-8	2	A. C.	7/8	18	Ecco	Haynes	A
	Single	6-8	15	*6-8	12	6-8	2	6-8	2	A. C.	7/8	18	Klaxon	Haynes	47
20	Single	6-8	15	6	4	3-4	2	3-4	2	A. C.	7/8	18	Sparton	H. C. S. Special	
15	Double	12-16	30			6-8	2	6-8	2	Bethlehem	7/8	18	Sparton	Hollier	206-B
25	Single	6-8	15	6-8	4	3-4	2	*3-4	2	A. C.	7/8	18	Klaxon	Holmes	
10	Single	6-8	15			6-8	2	6-8	2	A. C.	7/8	18	Sparton	Hudson Super Six	
15	Single	6-8	15			6-8	2	6-8	2	A. C.	7/8	18	Huffman		
20	Single	6-8	15			6-8	2	6-8	2	A. C.	7/8	18	Trojan	Hupmobile	R
15	Single	6-8	15	6-8	4	3-4	2	3-4	2	Champion	7/8	18	Stewart	Jackson	6-38
20	Double	6-8	15	*6-8	4	s6-8	2	s6-8	2	Champion	7/8	18	Newton	Jones	
	Single	6-8	18	*6-8	4	6-8	3	6-8	3	A. C.	7/8	18	Sparton	Jordan	F
	Single	6-8	18	6-8	4	6-8	3	6-8	3	A. C.	7/8	18	Sparton	Jordan	M
10	Single	6-8	21	6		6-8	2	6-8	2	A. C.	7/8	18	Sparton	Kenworthy	4-88&6-55
20	Single	6-8	15	*6-8	4	6-8	2	6-8	2	Champion	7/8	18	Sparton	King	8
	Double	6-8	18			d6-8	2	d6-8	2	A. C.	7/8	18	Sparton	Kissel	
	Single	6-8	15			6-8	2	d6-8	2	Champion	7/8	18	Klaxon	Kline	6-55-J
15	Single	6-8	21	6-8	6	3-4	2	3-4	2		7/8	18	Klaxon	LaFayette	
15-5	Single	6-8	32	6-8	5	6	2	6	2	Champion	7/8	18	Klaxon	Leach	
3	Single	6-8	21	6-8	4	6-8	2	d6-8	4	Bethlehem	7/8	18	E. A. L.	Lexington	S-20
10	Single	6-8	15	*6-8	4	6-8	2	d6-8	2	A. C.	7/8	18	United	Liberty	10 C
6	Single	6-8	21	6-8	4	6-8	2	6-8	2	Titan	7/8	18	Klaxon	Locomobile	48-6-7
	Single	6-8	17			6-8	2	6-8	2	A. C.	7/8	18	Schwarze	Lorraine	

Battery: Prest-O-Lite, Prest-O-Lite. Wiring system: GI, Generator and Ignition combined; GIM, Generator, Ignition, Motor combined; S, Generator, Motor Ignition separate; GM, Generator and Motor combined. Fuses: GT, Glass Tube; Cart, Cartridge; C. B., Circuit Breaker. Lamps: *Dashlights in series with taillights; headlight contains sidelight; d,—double contact; s,—single contact.

Specifications of the Electrical Equipment Found on 1920 Passenger Cars

Make and Model		IGNITION		GENERATOR		MOTOR	BATTERY				Wiring System	Units Combined	FUSES			
		System	Make	Control	Make	Voltage	Make	Voltage	Make	Amp. Hr.			Voltage	Type	Volts	Amp.
Maibohm	B	Single	At-Kent.	Hand	Bijur.	6	Bijur.	6	Willard.	94	6	1	S.	2-A.	6	20
Marmon	34	Single	Delco	Auto.	Delco	6	Delco	6	Willard.	162	6	1	GI.			
Maxwell	25	Single	At-Kent.	Hand		6		6	Prest-O-L.	87½	6	1	S.	3A.	6	20
McFarlan	127	Double	Opt.	Hand	West.	6	West.	6	Willard.		6	1	GI.	5 A. G.	6	
Mercer	Ser. 5	Single	Eisemann.	Hand	West.	6	West.	6	Willard.	182	6	1	S.	Cart.		10
Meteor	KR	Single	Simms	Hand	Bijur.	6	Bijur.	6	Willard.		6					
Metz, Master Six		Single	Conn.	Hand	West.	6	West.	6	Willard.	120	6	1				
Mitchell	F-40	Single	Remy	Hand	Remy	6	Remy	6	Willard.	90	6	1	GI.	GT.	6	10
Monitor		Single	Conn.	Hand	Dyneto.	6	Dyneto.		Prest-O-L.	110	6	1				
Monroe	S-9	Single	Conn.	Hand	A-L.	6	A-L.	6	U. S. L.	80	6	1				
Moon	6-48	Single	Delco	Auto.	Delco	6	Delco	6	Exide.	120	6	1	S.			
Moon	6-68	Single	Delco	Auto.	Delco	6	Delco	6	Exide.	120	6	1	S.			
Moore	F	Single	Conn.	Hand	A-L.	6	A-L.	6	Willard.	80	6	2				
Nash		Single	Wagner	H & A.	Delco.	6	Wagner	6	Willard.	100	6	1	S.			
National	Series BB	Single	Delco	H & A.	West.	6	West.	6	Prest-O-L.	110	6	1	S.	GT.	6-8	5
Nelson	D	Single	Bosch	Hand	U. S. L.	12	U. S. L.	12	Willard.	72	12	2	S.	G.	12	5-30
Noma	1-B	Single	Delco	Hand	Delco	6	Delco	6	Willard.	104	6					
Oakland	34-B	Single	Remy	Hand	Remy	6-8	Remy	6	Prest-O-L.	100	6-8	1	GI.			
Ogren	6-60	Single	Bosch	Hand	West.	6	West.	6	Willard.	120	6	1		Cart.	6	10
Oldsmobile	37-A	Single	Remy	Hand	Remy	6	Willard.	6	Remy	80	6	1				
Oldsmobile	45-B	Single	Delco	Hand	Delco	6	Delco	6	Willard.	80	6	1				
Olympian	45	Single	Conn.	Hand	A-L.	6	A-L.	6	U. S. L.		6					
Overland	4	Single	Conn.	Hand	A-L.	6-8	A-L.	6	U. S. L.	80	6-8	1	GI.	Glass.	6	20
Packard		Single	Delco	H & A.	Bijur.	6	Bijur.	6	Willard.	120	6	1	S.	GT.	6	10
Paige	All	Single	At-Kent.	H & A.	G & D.	6	G & D.	6	Willard.	108.4	6	1	S.	G.		20
Pan-American	All	Single	At-Kent.	Hand	West.	6	West.	6	Willard.	100	6	1	S.	G.	6	
Paterson	6-47	Dual	Delco	Hand	Delco	6	Delco	6	Willard.	110	6	1				
Peerless	Ser. 6	Single	At-Kent.	H & A.	A-L.	6	A-L.	6	Willard.		6	1				30
Piedmont	4-30	Single	Delco	Hand	Dyneto.	6	Dyneto.	6	Willard.	90	6	1	S.			
Piedmont	6-40	Single	Remy	Hand	Remy	6	Remy	6	Willard.	90	6	1	S.			
Pierce-Arrow	38&48	Double	Delco	H & A.	West.	6-8	West.	6	Willard.	150	6	1	S.	5 A. G.	6-8	
Pilot	6-45	Dual	Delco	Hand	Delco	6	Delco	6	Prest-O-L.	80	6	1	GI.			
Porter	46	Dual	Berling	Hand	West.	12	West.	12	Prest-O-L.	118	12	1	S.	Cart.	12	15
Premier	6-D	Single	Delco	Hand	Delco	6	Delco	6	Willard.	123.5	6	1	S.			
Reo	T & U	Single	North East	Hand	North East	6	North East	6	Willard.	108.5	6	2	GI.	Wire.	6	5
Leo	T 6 & U6	Single	North East	Hand	North East	6	North East	6	Willard.	108.5	6	1	S.	Wire.	6	6
Revere		Single	Bosch	Hand	West.	6	West.	6	Willard.	120	6	1	S.	GT.	6	15
Roamer	4-75	Single	Bosch	Hand	West.	6	West.	6	Columbia	117	6	1	S.	3A.	6	15
Roamer	4-75	Single	Bosch	Hand	West.	6	West.	6	Columbia	117	6	1	S.	3A.	6	15
R & V Knight	J & R	Dual	Wagner	Hand	Wagner	6	Wagner	6	Willard.	117	6	1	S.	Cart.	250	20
Saxon	125	Single	Remy	Hand	Wagner	6	Wagner	6	Prest-O-L.	80	6	1	S.	Cart.	6-8	15
Sayers	C.P.	Single	Delco	Hand	Delco	6	Delco	6	Willard.	80	6	1	GI.	C.B.		
Scrapps-Booth	B	Single	Remy	Hand	Remy	6	Remy	6	Prest-O-L.	85	6	1	GI.	GT.	6	20
Seneca	L	Single	Conn.	Hand	Allis Chal.	6	Allis Chalm	6	Prest-O-L.	88	6	1	GM.			20
Severin	H	Single	Wagner	Hand	Wagner	6	Wagner	6	Campbell	110	6	1	None	Cart.	6	10
Singer	20	Single	Bosch	Hand	West.	6	West.	6	Willard.	115	6	1	S.	G. C.		5&10
Skelton	35	Single	Conn.	Hand	West.	6	West.	6	Prest-O-L.	85	6	1	S.		6	10
Spacke	S-20															
Standard	8-1	Double	Dixie	Hand	West.	6	West.	6	Willard.	160	6	1	S.W.	2-A.	6	15
Stanley	735				Remy	6			Willard.	100	6	1	G.	Cart.	6	20
Stanwood	12	Single	At-Kent.	Hand	West.	6	West.	6	Willard.	108	6	1	S.	Cart.	6	10
Stearns	SKL-4	Single	At-Kent.	Hand	West.	12	West.	12	Willard.	61.5	12	1	S.			20
Stephens	80	Single	Conn.	Hand	A-L.	6	A-L.	6	U. S. L.	116	6	1	S.	Cart.	6	20
Stevens-Duryea	E	Double	Berling	Hand	West.	6-8	West.	6-8			6-8	1	S.	Cart.	6	15
Studebaker	All	Single	Wagner	Hand	Wagner	6	Wagner	6	Willard.	115	6-8	1	S.	Cart.	6	10
Stutz	H	Double		Hand	Remy	6	Remy	6	Willard.		12	1				
Templar	445	Single	Simms	Hand	Bijur.	6	Bijur.	6	Columbia	100	6	1	S.		6	20
Texan	B-38&A-38	Single	Conn.	Hand	Bijur.	6	Bijur.	6	Prest-O-L.	80	6	1	S.	Cart.	6	20
Tulsa	E-1,2,3	Single	Delco	Hand	Dyneto.	6	Dyneto.	6	Exide.	90	6	1	S.	GT.	6	15
Velie	48	Single	At-Kent.	S. A.	Bijur.	6	Bijur.	6	Willard.	120		1	S.	Wire.		15
Vogue	6-55 & 6-66	Single	Conn.	Hand	A-L.	6	A-L.	6	Willard.	108	6	1		Cart.	1-250	15
Wasp		Single	Bosch	Hand	West.	6	West.	6	Exide	135	6	1	S.	Cart.	6	20
Westcott	C-38&C-48	Single	Delco	H & A.	Delco	6	Delco	6	Willard.	120	6	1	S.	CB.		
Willys-Knight	20	Single	Conn.	Hand	A-L.	6-8	A-L.	6	U. S. L.	170	6	1	GI.	GT.	6	20
Winton Six	24	Single	Bosch	Hand	Bijur.	6	Bijur.	6	Willard.	120	6		S.	GT.	6	15
Winton Six	25	Single	Bosch	Hand	Bijur.	6	Bijur.	6	Willard.	139	6	1	S.	CB.		
Winther	61	Single	West.	Hand	West.	6	West.	6	Willard.	127	6		S.	GI.	6	10
Wolverine		Single	Bosch	Hand	Bijur.	6	Bijur.	6	Prest-O-L.	120	6	1	S.	CB.	6	15

ABBREVIATIONS: *Starting and Lighting in closed models only. Ignition: At-K, Atwater-Kent; Conn., Connecticut; West, Westinghouse; Auto, Automatic; H. & A, Hand and Automatic; S. A., Semi-Automatic. Generator: A-L, Auto-Lite; G & D, Gray & Davis; Leece-N, Leece-Neville; Ward-L., Ward-Leonard; N. E., North East; Split, Splitdorf. Motor: A-L, Auto-Lite, G & D, Gray & Davis; Leece-N, Leece-Neville; West, Westinghouse.

Giving Ignition, Starting, Lighting, Battery, Lamp, Spark Plug and Horn Data

LAMP CANDLEPOWER, VOLTAGE AND TYPE OF BASE										SPARK PLUGS			Horn	Make and Model
Base Contact	HEADLIGHTS		SIDELIGHTS		TAILLIGHTS		DASHLIGHT		Make	Diam. Inches	Thread Pitch			
	Volts	CP.	Volts	CP.	Volts	CP.	Volts	CP.						
20	Single...	6-8	20	6-8	4	6-8	2	6-8	2	Champion...	7/8	18	Schwarze	Maibohm.....B
	Single...	6-8	27	*6-8	8	6-8	2	6-8	2	A. C.	7/8	18	Sparton...	Marmon.....34
20	Single...	6-8	15			6-8	2	6-8	2	Champion...	7/8	18	Schwarze	Maxwell.....25
	Single...	6-8	21	*6-8	12	6-8	2	d6-8	2	A. C.	7/8	18	Klaxon...	McFarlan.....127
10	Single...	6-8	20	6-8	5	6-8	2	6-8	4	Champion...	7/8	18	Sparton...	Mercer.....Ser. 5
	Single...	6-8		6-8		6-8		6-8						Meteor.....K R
10	Single...	6-8	16	6-8	4	6-8	2	6-8	2	Champion...	7/8	18	Trojan...	Metz, Master Six.....
	Single...		15			6	2	d6	2	A. C.	7/8	18	Sparton...	Mitchell.....F-40
	Double...	6-8	16			6-8	2	6-8	2	Champion...	7/8	18	Klaxon...	Monitor.....
	Single...	6-8	20			6-8	2	d6-8	2	Champion...	7/8	18	Trojan...	Monroe.....S-9
	Single...	6-8	20			6-8	2	d6-8	2	Champion...	7/8	18	Klaxon...	Moon.....6-48
	Single...	6	20	6-8		6-8	2			Champion...	7/8	18	Klaxon...	Moon.....6-68
										Champion...	7/8	18	Garford...	Moore.....F
	Single...	6-8	15	*6-8	4	6-8	2	d6-8	2	A. C.	7/8	18	Trojan...	Nash.....
8		6-8	20	*6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Sparton...	National.....Series BB
5-30	Double...	12-16	15	12-16	4	12-16	2	12-16	2	Champion...	7/8	18	Schwarze	Nelson.....D
	Single...	6-8				6-8		d6-8						Noma.....1-B
	Single...	6-8	15			6-8	2	6-8	2	A. C.	7/8	18	Schwarze	Oakland.....34-B
10	Single...	6	32	6		6	4	6	4	Champion...	7/8	18	Klaxon...	Ogren.....6-60
	Single...	6-8	15	6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Klaxon...	Oldsmobile.....37-A
	Single...	6-8	15	*6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Klaxon...	Oldsmobile.....45-B
20	Single...	6-8	16			3-4	2	*3-4	2	Champion...	1/2		E. A. Lab.	Olympian.....45
										Champion...	1/2		A. L.	Overland.....4
10	Single...	6-8	21	*6-8	4	6-8	2	6-8	4	A. C.	7/8	18	Sparton...	Packard.....
20	Single...	6-8	17	6-8	4	6-8	2	d6-8	2	A. C.	7/8	18	Trojan...	Paige.....All
	Single...	6-8	32	6-8		6-8	2	*3-4	4	Champion...	7/8	18	E. A. Lab.	Pan-American.....All
	Single...	6-8	15	6-8	4	6-8	2	6-8	2	A. C.			E. A. Lab.	Paterson.....6-47
30	Single...	6-8	15	6-8		6-8	2	6-8	4	A. C.			Sparton...	Peerless.....Ser. 6
	Single...	6-8	12			6	2	6	2	Champion...	7/8	18	Klaxon...	Piedmont.....4-30
	Single...	6-8	12			6	2	6	2	Champion...	7/8	18	Klaxon...	Piedmont.....6-40
8	Single...	6-8	20			6-8	5	6-8	5	A. C.	7/8	18	Klaxon...	Pierce-Arrow.....38&48
	Single...	6-8	15			6-8	2	6-8	2	A. C.	7/8	18	Schwarze	Pilot.....6-45
2	Single...	12-16	20	12-16	4	12-16	4	12-16	2	Champion...		18	Stewart...	Porter.....46
	Double...	6-8	21	*6-8	4	6-8	2	d6-8	2	A. C.	7/8	18	Klaxon...	Premier.....6
5	Double...	6-8	15			3-4	2	*3-4	2	A. C.	7/8	18	Trojan...	Reo.....T & U
6	Single...	6-8	15			6	2	*3-4	2	A. C.	1/2		Klaxon...	Reo.....T6 & U6
15	Single...	6-8	20	*6-8	8	6-8	4	6-8	4	Rajah.....	7/8	18	Klaxon...	Revere.....
15	Single...	6-8	15	6-8	8	6-8	2	4	2	A. C.	7/8	18		Roamer.....4-75
50	Single...	6-8	15	6-8	4	6-8	2	d6-8	4	A. C.	7/8	18	Sparton...	Roamer.....4-75
													Klaxon...	R & V Knight. J. & R.
8	Single...	6-8	15			6-8	2	6-8	2	A. C.	7/8	18	Trojan...	Saxon.....125
	Single...	6-8	15			6-8	2	d6-8	2	Champion...	7/8	18	Stewart...	Sayers.....C. P.
20	Single...	6-8	18			6-8	2	6-8	2	A. C.	7/8	18	Klaxon...	Scripps-Booth.....B
20	Single...	6-8	15	6-8	2	6-8	2	d6-8	2	A. C.	7/8	18	Fitzgerald	Seneca.....L
10	Double...	6	17	6	5	6	2	6	2	Champion...	7/8	18	Klaxon...	Severin.....H
5&10	Single...	6-8	15		4	6-8	2	d6-8	2	A. C.	7/8	18	Klaxon...	Singer.....20
6	Single...	6	18			6	2	6	2	Bethlehem...	7/8	18	E. A. Lab.	Skelton.....35
														Spacke.....S-20
15	Double...	6-8	21	6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Klaxon...	Standard.....8-I
20	Double...	6-8	21	6-8	4	6-8	2	6-8	2				Klaxon...	Stanley.....735
10	Single...	6	17	6	10	6	7	6-8	2	Champion...	7/8	18	Klaxon...	Stanwood.....12
20	Single...	12-16	21	*12-16	4	12-16	2	12-16	2	A. C.	7/8	18	B. & A. Lab.	Stearns.....SKL-4
20	Single...	6-8	15	6-8	2	6-8	2	6-8	2	Champion...	7/8	18	Trojan...	Stephens.....80
15	Single...	6-8	21	6-8	4	6-8	2	6-8	2	Opt.....	7/8	18	Klaxon...	Stevens-Duryea.....E
10	Single...	6-8	12			6-8	2	6-8	2	Champion...	1/2		Sparton...	Studebaker.....All
	Double...	6-8	15	*6-8	4	6-8	2	6-8	2	A. C.			Klaxon...	Stutz.....H
20	Single...	6-8	21	*6-8	4	6-8	2	6-8	2	Champion...	7/8		Klaxon...	Templar.....445
20	Single...	6	16			6	5	6	5	Champion...	7/8	18	Klaxon...	Texas.....B38&A38
15	Single...	6-8	21	6-8	2	6-8	2	d6-8	2	Champion...	7/8	18	Trojan...	Tulsa.....E-1,2,3
	Single...	6-8	15	6-8	4	6-8	4	d6-8	4	Champion...	7/8	18	Sparton...	Velie.....48
1-250														Wasp.....
	Single...	6-8	18	*6-8	4	3-4	2	d3-4	2	A. C.	7/8	18	Klaxon...	Westcott.....C-38&C-48
	Single...	6-8	30			3-4	2	*3-4	2	Champion...			Sparton...	Willys-Knight.....20
20	Single...	6-8	21	6-8	6	6-8	2	6-8	2	Champion...	7/8	18	American...	Winton Six.....24
15	Single...	6-8	21	6-8	6	6-8	2	6-8	2	Champion...	7/8	18	Electric...	Winton Six.....25
	Single...	6	18			6	4	6	2	A. C.	7/8	18	Klaxon...	Winther.....61
10	Single...	6-8	32	6-8	7	6-8	2	6-8	2	A. C.	7/8	18	Klaxon...	Wolverine.....
15	Single...	6-8	21	6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Klaxon...	Vogue.....6-55 & 6-66

Battery: Prest-O-Lite, Prest-O-Lite. Wiring system: GI, Generator and Ignition combined; GIM, Generator, Ignition, Motor combined; S, Generator, Motor Ignition separate; GM, Generator and Motor combined. Fuses: GT, Glass Tube; Cart, Cartridge; C. B., Circuit Breaker. Lamps: *Dashlights in series with taillights; headlight contains sidelight; d,—double contact; s,—single contact.

From the Four Winds

Glimpses at the World of Motordom

Coming Motor Events

AUTOMOBILE SHOWS		
Northampton, Mass.	Annual Automobile Show	Oct. 6-8
FOREIGN SHOWS		
Antwerp	Cars, Tires, Wheels, Parts and Equipment	May 15-June 13
Antwerp	Commercial Vehicles, Tractors, Trucks and Engines	June 26-July 25
London, Eng.	Commercial Vehicles, Exhibition, Olympia	October
London	Passenger Car Show, Olympia	November
CONVENTIONS		
Charleston, S. C.	South Carolina Automotive Trade Ass'n	June 24, 25
RACES		
Indianapolis	500-Mile Speedway Race	May 31
Hanford, Cal.	Dirt Track	May 31
Brockport, N. Y.	Dirt Track	May 31
Uniontown, Pa.	Speedway Race	June 12
Portland, Ore.	Dirt Track	June 17
Chicago, Ill.	Inter Club Run	June 17-18
Ogdensburg, N. Y.	Dirt Track	June 19
Hanford, Cal.	Dirt Track	July 4
Spokane, Wash.	Dirt Track	July 4
Tacoma, Wash.	Speedway Race	July 5
Batavia, N. Y.	Dirt Track	July 5
Warren, Pa.	Dirt Track	July 17
Watertown, N. Y.	Dirt Track	July 24
Fulton, N. Y.	Dirt Track	July 31
Paris, France	Grand Prix Race, Sporting Commission	August
Eric, Pa.	Dirt Track	Aug. 7
Buffalo, N. Y.	Dirt Track	Aug. 14
Johnstown City, Pa.	Dirt Track	Aug. 21
Elgin, Ill.	Road Race	Aug. 21
Middletown, N. Y.	Dirt Track	Aug. 20-21
Flemington, N. J.	Dirt Track	Aug. 27-28
Cannondigua, N. Y.	Dirt Track	Aug. 28
Cincinnati, O.	Speedway Race	Sept. 6
Hornell, N. Y.	Dirt Track	Sept. 6
Uniontown, Pa.	Speedway Race	Sept. 6
Syracuse, N. Y.	Dirt Track	Sept. 17-18
Allentown, Pa.	Dirt Track	Sept. 25
TOURS		
Salt Lake City-Boise	Truck Tour	May 17-27
Atlanta, Ga.	Truck Tour	May-17-22
Omaha, Neb.	Truck Reliability Run	June 14
Milwaukee, Wis.	Wisconsin Truck Tour, Milwaukee Sentinel	June 21-26
Lake Huron Tour	Michigan Pikes Ass'n	July 4
New York-San Francisco	Glidden Tour	September

New York Prisoners Make License Plates—The first automobile license plates to be made in a prison in New York state were turned out at the prison in Auburn recently, by one of the most modern and best equipped license plate industries in the country, installation of which has been going on within the prison for the past eight weeks.

The sample plates have been sent to Secretary of State Hugo, and if found satisfactory will be destroyed and the prison officials will be notified to start the manufacture of 1921 plates. It is expected that more than 2,000,000 automobile license plates will be made here for use in 1921.

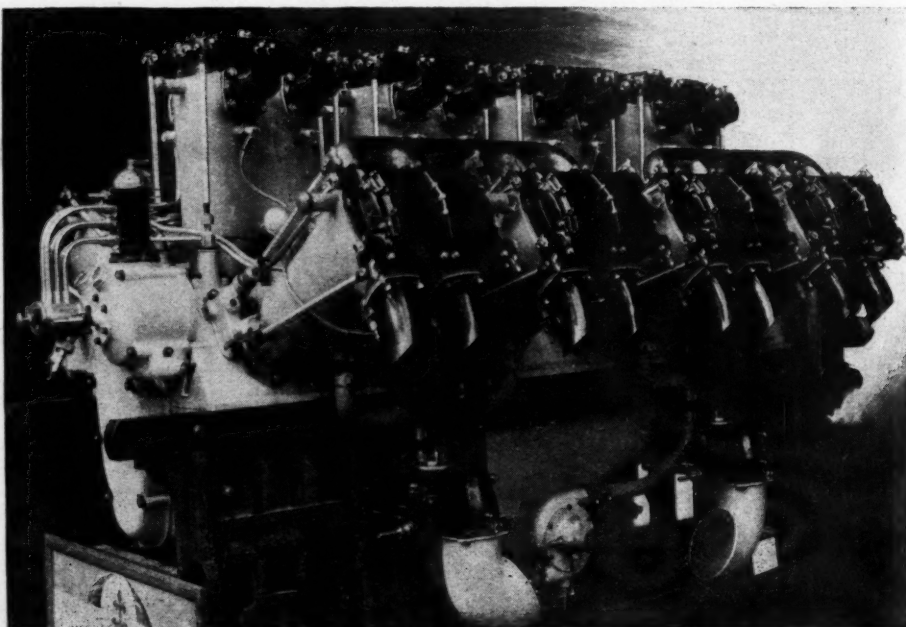
Daniel J. Grant, superintendent of industries, announces that the number of plates turned out for the approval of the secretary of state have the full quota of numbers, merely as a demonstration of the work of the equipment. When the numbers which are to be used next year are to be started, they will be run in rotation. Stamped from a long sheet of steel, the number of plates are cut, the numbers and letters stamped, the paint applied and baked, all by the machinery installed during the past two months.

It is expected that the state will make a big saving in manufacturing its own license plates, which cost about twenty-nine cents each. The price of the prison-made plates cannot as yet be determined, but the decrease in the cost of labor will be considerable. A metal worker gets anywhere from sixty to eighty cents an hour, while state prison inmates get one and one-half cents a day.

Massachusetts Automobile Figures—Registrations during the first five months show that close to 600,000 of the probably 4,000,000 or more people in Massachusetts travel or can travel daily by motor vehicle. In other words there are accommodations in the motor cars, trucks and cycles registered in Massachusetts for one-seventh of its entire population; or by making between six and seven trips, the motor vehicles could move every man, woman and child in the commonwealth.

This great transportation capacity is indicated by figures prepared this week by Frank A. Goodwin, state registrar of motor vehicles. There have been registered a total of 218,500 motor vehicles of all sorts. These include 162,800 passenger cars of private owners, 39,400 trucks, 8300 motor cycles and 8000 cars owned by dealers.

Allowing an average of three persons each for the passenger cars, they will carry 488,400 people.



Have you ever seen 1000 horses hooked up and every one of them working in unison. Well, here is the way they look. This engine has twenty-four cylinders, is of the modified Y type. It is made by the Lorraine-Dietrich Co. of France